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FAN POWERED TERMINAL UNITS

INSTALLATION, START-UP, AND SERVICE INSTRUCTIONS FOR KRUEGER TERMINAL UNITS

Models: KLPS, KLPS-D, KLPP, KFSS, KQFS, KQFS-FA, KQFP, QFC, QFV

KRUEGER

Fan Powered Terminal Units IOM

TABLE OF CONTENTS

SAFETY NOTE

Air-handling equipment will provide safe and reliable service when operated within design specifications. The equipment should be operated and serviced only by authorized personnel who have a thorough knowledge of system operation, safety devices, and emergency procedures. Good judgment should be used in applying any manufacturer's instructions to avoid injury to personnel or damage to equipment and property.

WARNING: Disconnect all power to the unit before performing maintenance or service. Unit may automatically start if power is not disconnected. Electrical shock and personal injury could result.

WARNING: If it is necessary to remove and dispose of mercury contactors in electric heat section, follow all local, state, and federal laws regarding disposal of equipment containing hazardous materials.

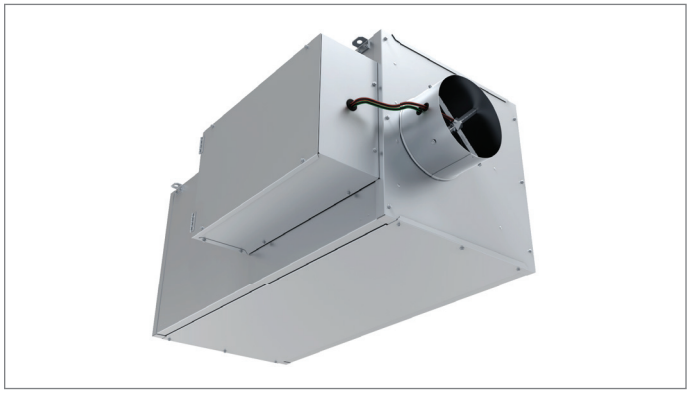

Figure 1 - Series Fan Powered Terminal Unit (KFSS)

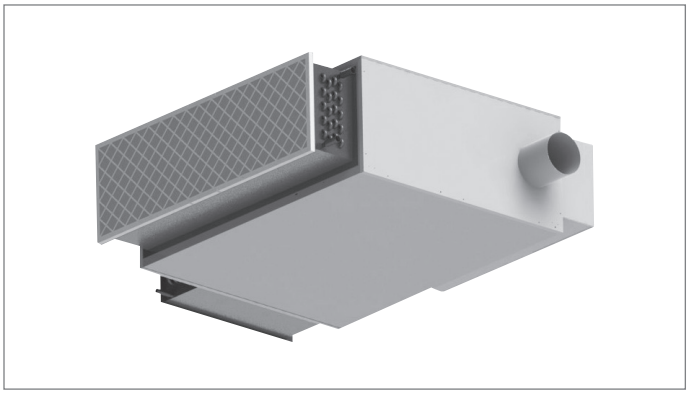

Figure 2 - Series DOAS Fan Powered Terminal Unit (KLPS-D)

PRE-INSTALLATION

GENERAL

The KLPS, KLPS-D, KFSS, KQFS, KQFS-FA & QFC constant volume (series) and KLPP, KQFP & QFV variable volume (parallel) fan powered boxes (see Figure 1 & 2) are equipped to provide pressure independent, variable volume (VAV). The units can also be equipped with factory-installed Analog, Pneumatic, Digital or field supplied direct digital controls. Units are available with factory-installed electric or hot water heat.

CONTROL OFFERINGS

Each KLPS, KLPS-D, KLPP, KFSS, KQFS, KQFS-FA, KQFP, QFC & QFV unit is supplied with four quadrant multi-point center averaging airflow sensor as a standard feature. These sensors offer airflow averaging capability that results in an airflow sensing capacity equal to any competitive unit.

Control options include pressure independent pneumatic, analog electronic and field supplied direct digital. Pneumatic controls are available with linear actuators and single-function or multi-function controllers. The multi-function controller provides a simple switchover from normally open to normally closed applications. Electronic control units feature a factory-installed enclosure that provides easy access for field connections.

STORAGE AND HANDLING

Inspect for damage upon receipt. Shipping damage claims should be filed with shipper at time of delivery. Store in a clean, dry, and covered location. Do not stack units. When unpacking units, care should be taken that the inlet collars and externally mounted components do not become damaged. Do not lift units using collars, sensors, or externally mounted components as handles. If a unit is supplied with electric or hot water heat, care should be taken to prevent damage to these devices. Do not lay uncrated units on end or sides. Do not stack uncrated units over 6 ft high. Do not handle control boxes by tubing connections or other external attachments. Table 1 shows component weights.

TABLE 1 - UNIT WEIGHTS - QFC (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
2	70	4	9	30	19	21
3	70	4	9	30	20	22
4	85	4	9	32	22	25
5	85	4	9	32	24	28
6	100	4	9	35	25	30
7	140	4	9	40	35	43

TABLE 1 - UNIT WEIGHTS - QFV (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
2	114	4	9	30	19	21
3	114	4	9	30	19	21
4	115	4	9	32	19	21
5	122	4	9	32	12	14
6	123	4	9	32	12	14
7	127	4	9	40	12	14

TABLE 1 - UNIT WEIGHTS - KFSS (lbs.)											
UNIT SIZE	UNIT WEIGHT	ELECTRIC HEAT ADD	HOT WATER ADD				ATTENUATOR ADD	STANDARD CONTROL ENCLOSURE ADD	90° CONTROL ENCLOSURE ADD	BOTTOM CONTROL ENCLOSURE ADD	REMOTE CONTROL ENCLOSURE ADD
			1-ROW	2-ROW	3-ROW	2-ROW					
3	80	21	9	11	15	19	7	11	27	21	18
4	90	21	12	17	23	28	7	11	27	21	18
5	110	21	12	17	23	28	9	11	27	21	18
6	120	24	12	17	23	28	10	11	27	21	18
7	165	39	20	29	39	48	20	11	27	21	18

TABLE 1 - UNIT WEIGHTS - KQFS (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
2	185	4	9	93	9	12
3	200	4	9	80	9	12
4	200	4	9	32	9	12
5	225	4	9	32	12	17
6	250	4	9	35	12	17
7	260	4	9	40	12	17

TABLE 1 - UNIT WEIGHTS - KQFP (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
2	185	4	9	34	9	12
3	200	4	9	30	9	12
4	200	4	9	37	9	12
5	225	4	9	32	12	17
6	250	4	9	34	12	17
7	260	4	9	44	12	17

TABLE 1 - UNIT WEIGHTS - KLPS (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
1	80	N/A	9	25	8	10
2	80	N/A	9	30	8	10
3	75	4	9	30	10	12
4	120	4	9	35	12	14
5	100	4	9	35	12	14

TABLE 1 - UNIT WEIGHTS - KLPS-D (lbs.)							
UNIT SIZE	UNIT WEIGHT WITH COOLING COIL			DDC CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
	2-ROW	4-ROW	6-ROW			1-ROW	2-ROW
1	100	107	115	9	25	8	10
2	100	108	120	9	25	8	10
3	97	106	120	9	30	10	12
5	130	145	160	9	35	12	14

TABLE 1 - UNIT WEIGHTS - KLPP (lbs.)						
UNIT SIZE	UNIT WEIGHT	PNEUMATIC CONTROLS ADD	DDC OR ANALOG CONTROLS ADD	ELECTRIC HEAT ADD	HOT WATER ADD	
					1-ROW	2-ROW
2	80	4	9	25	8	10
4	90	4	9	25	8	10

INITIAL INSPECTION

Once items have been removed from packing, check carefully for damage to duct connections, coils, or controls. File damage claims immediately with transportation agency and notify Krueger.

NOTE: Remove all packaging material and foreign material from unit and ensure the blower wheel moves freely before installation. Every fan terminal unit is shipped with cardboard ring in one side of the fan inlet that MUST be removed. This ring is accessible from the unit's plenum.

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FAN UNIT

For operation & Maintenance manual see
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FAN UNIT	**KQFP - 5 - 12**		CODE **- 10 - 579600 - C 014**		REV:
MOTOR	VOLT **277**		PHASE **1**	HZ **60**	
	HP **1/2**		FLA(EA)	**3.110**	
HEAT	VOLT **480**		PHASE **3**	HZ **60**	
	KW **12.0**		AMPS	**14.43**	
TAG:	**FPB - 313**				

MOTOR(S) ARE THERMALLY PROTECTED
MIN. SUPPLY CIRCUIT AMPS **21.920** REPLACEMENT LINE FUSE
MAX. FUSE OR HACR CIRCUIT BREAKERS **25.000 AMPS 25 AMP 600V**
MAX. OUTLET AIR TEMPERATURE 200 F
UNIT DESIGNED TO OPERATE AT NO LESS THAN 0.2 IWG STATIC PRESSURE.
ZERO CLEARANCE FROM UNIT. CONNECTED DUCT AND/OR PLENUM.
TO COMBUSTIBLE MATERIAL.

FIGURE 3 - Fan Unit Label

UNIT IDENTIFICATION

Each unit has 2 main labels attached to the casing. The FAN UNIT label (Figure 3) lists the model number, supply voltage requirements, motor horsepower and overcurrent protection requirements. The AIRFLOW label (Figure 4) lists the model number, unit size, factory order number and location. The location "tag" indicates where the unit is intended for installation. There may be other labels attached to the unit, as options or codes may require. Read all labels on a typical unit before attempting installation. Control boxes are assembled as indicated on the identification label.

Contact your local Krueger representative for more information.

INSTALLATION PRECAUTION

Check that construction debris does not enter unit or ductwork. Do not operate the central-station air-handling fan without final or construction filters in place. Accumulated dust and construction debris distributed through the ductwork can adversely affect unit operation.

SERVICE ACCESS

Provide service clearance for unit access (see Installation section for details).

CODES

Install units in compliance with all applicable code requirements.

UNIT SUSPENSION

See Installation section for unit suspension details.

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DUCT HEATER UP

AIR FLOW

For operation & Maintenance manual see
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ORDER :	**599049**	ITEM: **010**	REV:	SN:	**C - 599049 - 10**
MODEL:	**QFC**	DUCT SIZE: **12 X 10**		MIN FPM:	**0375**
LINE VLT:	**480**	PH: **03**	HZ: **60**	KW: **2.50**	AMP: **3.00**
STEP :	**01**	CTL VOLT: **24**		CTL VA:	**50**
MIN CIR AMP: **5.60**		**15 AMP 600V**		INTERNAL FUSE	

MAX FUSE OR HACR CIRCUIT BREAKERS **15.00** AMP
MIN WIRE SIZE (COPPER CONDUCTORS ONLY): **12AWG**
(SUITABLE FOR AT LEAST 75 DEGREES CENT.)
TAG: **VAV- 05-01**

FIGURE 4 - Air Flow Label

WARRANTY

All Krueger-furnished items carry the standard Krueger warranty.

CONTROL OPTIONS

The units are offered with a wide variety of factory-mounted controls that regulate the volume of air delivery from the unit and respond to cooling and heating load requirements of the conditioned space. All control packages can operate stand-alone and will fulfill the thermal requirements of a given control space. These devices are available in both pneumatic and electronic arrangements. A number of DDC control packages by others are available for consignment mounting as indicated. Each control approach offers a variety of operating functions; a control package number identifies combinations of control functions. Because of the variety of functions available, circuit diagrams, operating sequences, and function descriptions are contained in separate Application Data publications. These publications are available from the Krueger website, www.krueger-hvac.com, within the submittal icon.

ANALOG ELECTRONIC CONTROLS

Pressure independent control packages are available with or without hot water or electric heat, automatic or remote night shutdown, and automatic night setback. All control arrangements include a standard inlet airflow sensor, control enclosure, SCR fan speed controller, 24-volt transformer, fan relay, and wall thermostat to match the control type. See Tables 2A and 2B.

DIRECT DIGITAL CONTROLS (By Others)

Control sequences are available for factory installation of numerous field-supplied controls from various manufacturers including: Andover, Automated Logic, Invensys (Siebe), Siemens (Landis), Johnson, and others. All packages include a standard inlet airflow sensor, control enclosure, SCR fan speed controller, 24-volt transformer, and fan relay. Contact Krueger for information on mounting field-supplied controls.

TABLE 2A - ANALOG ELECTRONIC CONTROL ARRANGEMENTS - KLPS, KFSS, KQFS, QFC

PACKAGE NO.	DESCRIPTION
2200	Cooling Only
2201	Cooling Only With Automatic Night Shutdown
2203	Cooling Only With Automatic Night Shutdown
2204	Cooling With On/Off Hot Water Heat
2205	Cooling With On/Off Hot Water Heat With Automatic Night Shutdown
2207	Cooling With On/Off Hot Water Heat With Automatic Night Shutdown
2208	Cooling With Proportional Hot Water Heat
2209	Cooling With Proportional Hot Water Heat With Automatic Night Shutdown
2211	Cooling With Proportional Hot Water Heat With Automatic Night Shutdown
2212	Cooling With Up To 3 Stages Of Electric Heat
2213	Cooling With Up To 3 Stages Of Electric Heat W/ Automatic Night Shutdown
2215	Cooling With Up To 2 Stages Of Electric Heat W/ Automatic Night Shutdown
2217	Cooling/Heating with Automatic Changeover
2218	Cooling with Solid State LineaHeat Proportional Heat

TABLE 2B - ANALOG ELECTRONIC CONTROL ARRANGEMENTS - KLPP, KQFP, QFV

PACKAGE NO.	DESCRIPTION
2300	Cooling With Sequenced Fan
2301	Cooling With Sequenced Fan & Automatic Night Shutdown
2302	Cooling With Sequenced Fan & Automatic Night Setback
2303	Cooling With Sequenced Fan & On/Off Hot Water Heat
2304	Cooling With Sequenced Fan & On/Off Hot Water Heat & Automatic Night Shutdown
2305	Cooling With Sequenced Fan & On/Off HotWater Heat & Automatic Night Setback
2306	Cooling With Sequenced Fan & Proportional Hot Water Heat
2307	Cooling With Sequenced Fan & Proportional Hot Water Heat & Automatic Night Shutdown
2308	Cooling With Sequenced Fan & Proportional Hot Water Heat & Automatic Night Setback
2309	Cooling With Sequenced Fan & Up To 2 Stages Of Electric Heat
2310	Cooling With Sequenced Fan & Up To 2 Stages Of Electric Heat & Automatic Night Shutdown
2311	Cooling With Sequenced Fan & Up To 2 Stages Of Electric Heat & Automatic Night Setback
2313	Cooling with Solid State LineaHeat Proportional Heat
2314	Cooling with Solid State LineaHeat Proportional Heat and Automatic Night Shutdown On Loss Of Primary Air

PNEUMATIC CONTROLS

Pressure independent control packages are available with or without hot water or electric heat, night shutdown and/or unoccupied heating. All control arrangements include a standard inlet airflow sensor and SCR fan speed controller. See Tables 3A and 3B.

Single function controller: Provides single function, i.e., DA-NO.

Multi-function controller: Capable of providing DA-NO, DA-NC, RA-NC or RA-NO functions.

NO CONTROL UNITS

Control sequences are also available to provide a control box on units supplied with no factory-installed controls. These arrangements include a standard inlet airflow sensor, control enclosure, SCR fan speed control, 24-volt transformer, and fan relay. See Table 4.

TABLE 3A - PNEUMATIC CONTROL ARRANGEMENTS - KLPS, KFSS, KQFS & QFC	
PACKAGE NO.	DESCRIPTION
1300	Single Function Controller; DA-NO With or Without Auxiliary Heat
1301	Single Function Controller; DA-NO With or Without Auxiliary Heat And With Night Shutdown
1302	Single Function Controller; DA-NO With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating
1303	Single Function Controller; RA-NC With or Without Auxiliary Heat
1304	Single Function Controller; RA-NC With or Without Auxiliary Heat And With Night Shutdown
1305	Single Function Controller; RA-NC With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating
1306	Multi-Function Controller; DA-NO With or Without Auxiliary Heat
1307	Multi-Function Controller; DA-NO With or Without Auxiliary Heat And With Night Shutdown
1308	Multi-Function Controller; DA-NO With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating
1309	Multi-Function Controller; DA-NC With or Without Auxiliary Heat
1310	Multi-Function Controller; DA-NC With or Without Auxiliary Heat And With Night Shutdown
1311	Multi-Function Controller; DA-NC With or Without Auxiliary Heat, With Night Shutdown And Unoccupied Heating
1312	Multi-Function Controller; RA-NC With or Without Auxiliary Heat
1313	Multi-Function Controller; RA-NC With or Without Auxiliary Heat And With Night Shutdown
1314	Multi-Function Controller; RA-NC With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating
1315	Multi-Function Controller; RA-NO With or Without Auxiliary Heat
1316	Multi-Function Controller; RA-NO With or Without Auxiliary Heat And With Night Shutdown
1317	Multi-Function Controller; RA-NO With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating

TABLE 3B - PNEUMATIC CONTROL ARRANGEMENTS - KLPP, KQFP, QFV	
PACKAGE NO.	DESCRIPTION
1400	Single Function Controller; DA-NO With or Without Auxiliary Heat
1401	Single Function Controller; RA-NC With or Without Auxiliary Heat
1402	Multi-Function Controller; DA-NO With or Without Auxiliary Heat
1403	Multi-Function Controller; RA-NO With or Without Auxiliary Heat
1404	Multi-Function Controller; DA-NC With or Without Auxiliary Heat And With Night Shutdown
1405	Multi-Function Controller; RA-NC With or Without Auxiliary Heat,With Night Shutdown And Unoccupied Heating

TABLE 4 - NO CONTROL UNIT OPTIONS	
PACKAGE NO.	DESCRIPTION
D000	Field Supplied And Mounted Controls By Others On Units Without Electric Heat
D001	Field Supplied And Mounted Controls By Others On Units With Electric Heat

INSTALLATION

STEP 1 - INSTALL FAN - POWERED BOX

SELECT LOCATION

1. Units should be installed so that they do not come in contact with obstacles such as rigid conduit, sprinkler piping, Greenfield flexible metal covering, or rigid pneumatic tubing; such contact can transmit vibration to the building structure, causing objectionable low frequency noise.
2. Units should never be installed tight against concrete slabs or columns, as vibration transmission is amplified in this condition.
3. Fan powered terminals require sufficient clearance for servicing the blower/motor assembly from the bottom of the unit, low voltage controls from the side and line voltage motor controls or electric heat (if equipped) from the rear (discharge end) of the unit.

   Bottom access panel removal requires a minimum of 3" minimum clearance, plus substantial horizontal clearance to slide the access panel out of the way for service. Actual horizontal dimensions will vary due to varying access panels for different sized units. See the specific unit's submittal drawings for more detail.

   NOTE: Be certain appropriate accommodations for panel removal of most unit casings are large enough to allow adequate internal service room once the panels are removed.

   A minimum clearance of 18"* is recommended for control enclosure access. Unit control enclosure will vary depending on which control package is used. Control enclosure location is specified on unit submittals. Low voltage enclosure covers are removable, not hinged.

   A clearance of 36"* is recommended for line voltage motor controls and electric heat control access. High- voltage motor controls or electric heat control access is supplied with hinged access doors for units with fused disconnect. Specific location is indicated on the unit submittal.

   NOTE: These recommendations do not supersede NEC (National Electrical Code) or local codes that may be applicable, which are the responsibility of the installing contractor.
4. Whenever possible, fan-powered boxes should be installed over halls or passageways (rather than over occupied spaces) in order to limit the sound reaching occupants.

POSITION UNIT

1. When moving boxes, use appropriate material handling equipment and avoid contact with shaft extensions, controls, wiring, piping, heaters, and control boxes.
2. Raise unit to position using safe mechanical equipment and support until hanging means are attached and box is level.

INSTALL UNIT

1. Install field-supplied eyebolts, straphangers or bolt rod supports as desired. Figure 5 illustrates possible unit suspension methods. A typical installation is shown in Figure 6.
2. Care should be taken to use hanging materials of sufficient stiffness and strength, rigidly attached to the unit. Straps should not be located on coil flanges, electric heat sections, or control boxes. When using trapeze supports, avoid areas where access is required to side mounted controls, or side or bottom access doors. For best installation with trapeze supports, provide elastomeric material between unit and supports.
3. Hangers should be securely attached to bar joist or mounting anchors properly secured to building structure with lugs or poured-in-place hangers. Percussion nails are not considered adequate anchors.

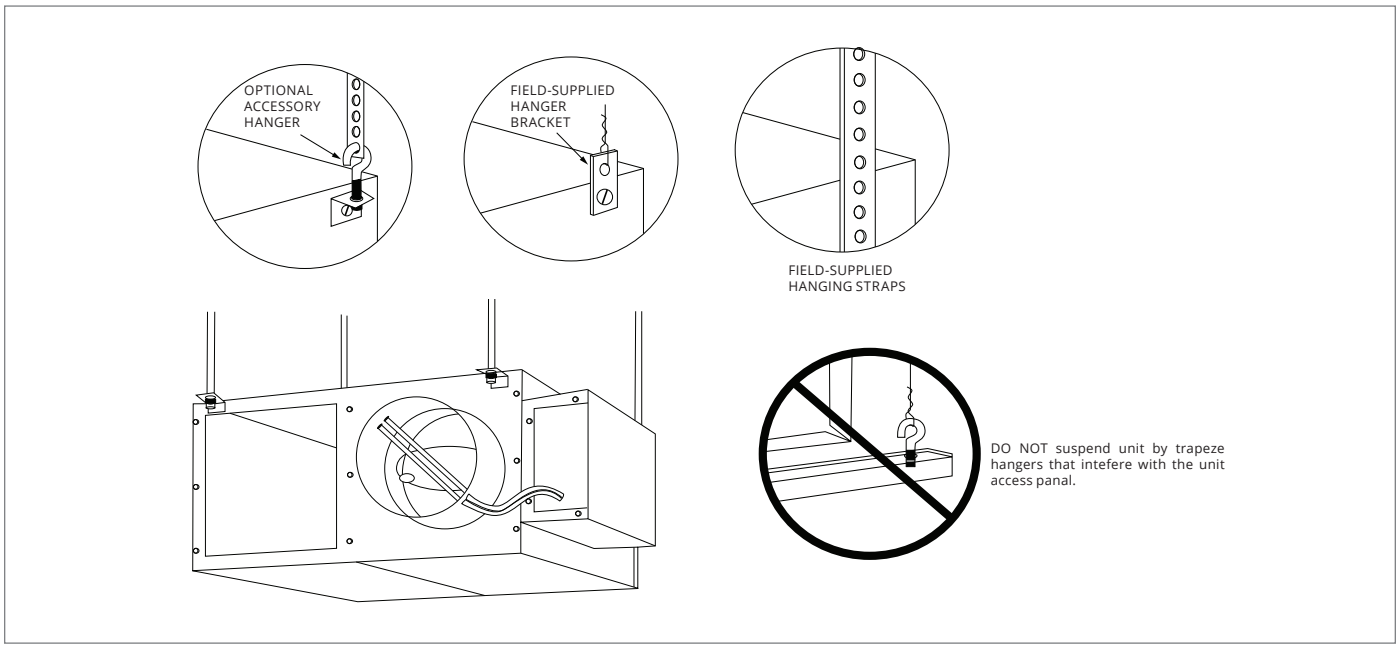


FIGURE 5 – Typical Unit Suspension Methods (KQFP Shown)

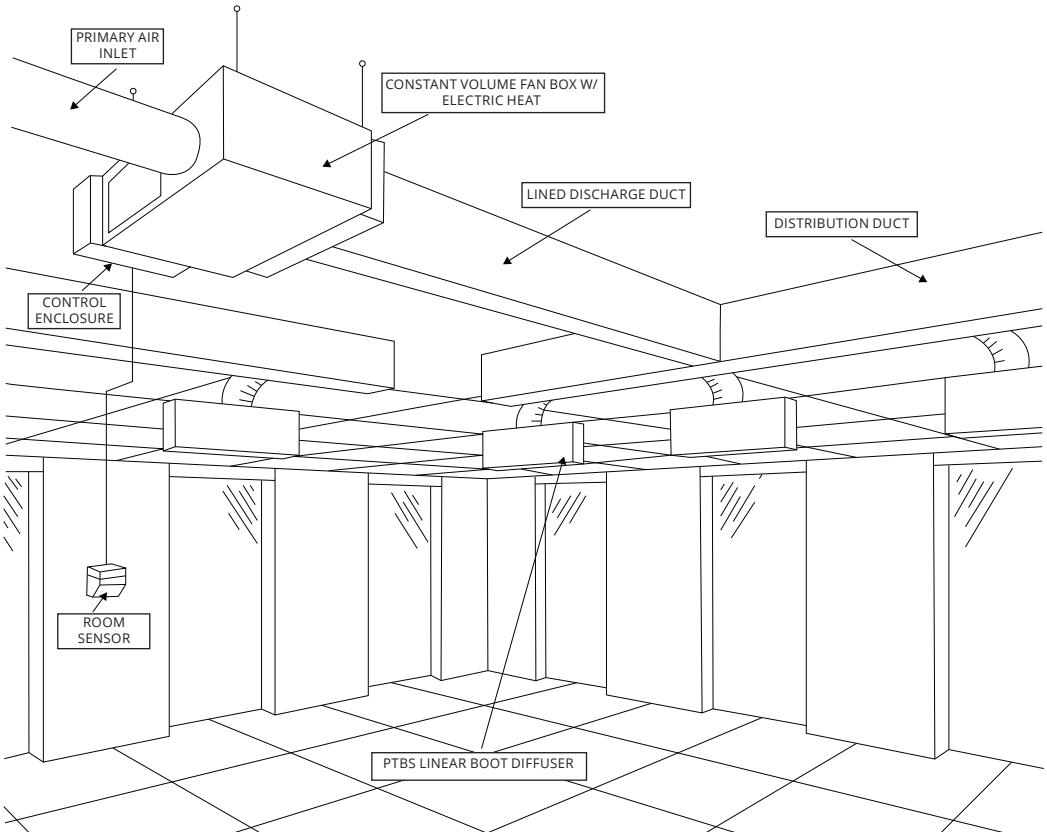


FIGURE 6 – Typical Perimeter Installation – Constant Volume Fan-Powered Box

STEP 2 - MAKE DUCT CONNECTIONS

1. Install supply ductwork on each of the unit inlet collars. It is recommended that 3 duct diameters of straight duct are supplied to the inlet of the unit. An elbow put at the inlet of the unit will create turbulence at the inlet making it difficult for the flow sensor to accurately measure the airflow. Check that the pressure pick-up in primary air collar is located properly and that air supply duct connections are airtight. Install supply ductwork on unit inlet collar, following all accepted medium-pressure duct installation procedures. Seal joints against leakage.

   NOTE: For maximum efficiency in controlling radiated noise in critical applications, inlet ducts should be fabricated of 24-gauge minimum sheet metal in place of flex connections. Flex duct is extremely transparent to radiated sound; consequently high inlet static's (Ps) or sharp bends with excessive pressure drop can cause a radiated noise problem in the space. If flex duct is used, it should be limited to the connection between the distribution duct and the boot diffuser.

2. Install the discharge duct. On units with electric heat, the recommended minimum distance of straight duct before any transitions, elbows or branch connections is 48". It is strongly recommended that lined discharge duct be used downstream of the unit. Insulate duct as required.
3. Fan boxes should not be attached to octopus sections immediately downstream of the unit.
4. Install optional return-air filters before operating the unit.
5. Where construction filters were supplied with the box, leave filters in place until installation is complete and building is cleaned for occupancy.

STEP 3 - POWER WIRING (see Figure 7.)

1. All power wiring must comply with local codes and with the NEC (National Electrical Code) ANSI/NFPA (American National Standards Institute/National Fire Protection Association) 70-1981. Disconnect switches are optional equipment. Electrical, control and piping diagrams are shown on the exterior labeling or on a diagram inside the control and high-voltage enclosure covers, unless otherwise specified in the order write-up. All units are wired for a single point electrical connection to the fan and electric heater (if equipped). Electric heaters provided by Krueger are balanced by kW per stage. The installing electrician should rotate incoming electric service by phase to help balance overall building load.
2. All field wiring must be provided with a safety disconnect per NEC 424-19, 20, and 21.

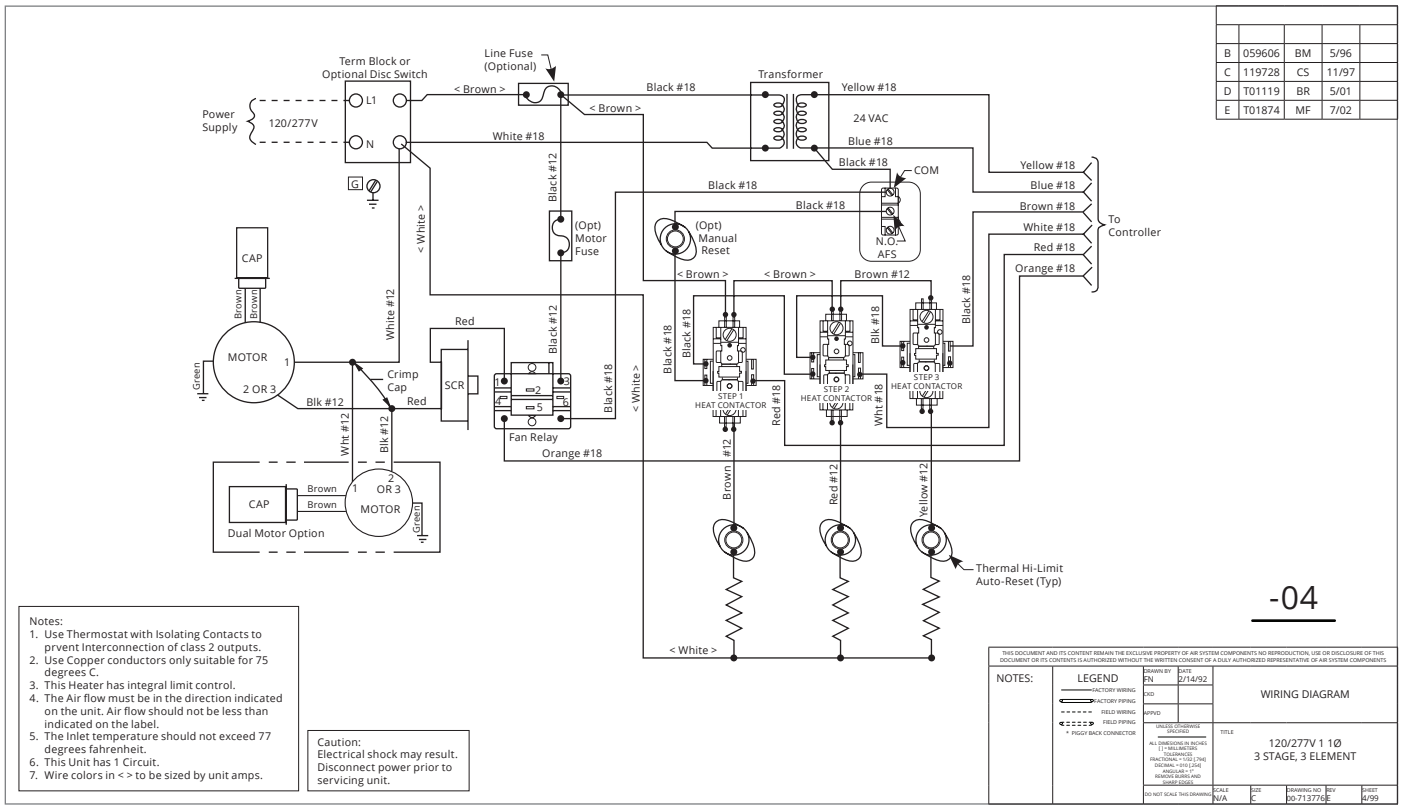


FIGURE 7 – Typical Power Connections for Fan Powered Units with 3-Stage Electric Heat

3. Disconnect all incoming power before wiring or servicing unit. All disconnect switches on the terminal (if equipped) should be in the OFF position while making power connections.
4. Units with electric heat should use copper wires rated at least 125% of rating plate amperage. Refer to the unit's rating label and minimum supply circuit amps.
5. Observe wiring diagram and instructions attached to the unit. **480-v, 3-phase units require a Wye power source with a 4th (neutral) wire in addition to the full sized ground wire.** All units must be grounded as required by NEC 424-14 and 250.

STEP 4 - SYSTEM SETUP AND CALIBRATION

GENERAL

The parallel fan powered terminals (KLPP, KQFP and QFV) are designed to provide varying quantities of cold primary air to a space in response to a thermostat demand for cooling. For a heating demand, the fan will operate to supply ceiling plenum air to the space. For units equipped with a heating coil, the heater will operate as required to meet a heating demand.

The series fan powered terminals (KLPS, KFSS, KQFS and QFC) are designed to provide a constant airflow to the space. The air supplied to the space is a mixture of primary air and ceiling plenum air. The fan speed is adjusted to provide the required airflow to the space. In response to a cooling demand from a thermostat, the damper will increase the amount of cold primary air while reducing the amount of ceiling plenum air to decrease the temperature of the air being delivered to the space.

Most terminal control packages provide pressure compensation to allow pressure independent operation of the primary air damper, regardless of changes to the available static pressure in the supply ductwork. To balance the unit it is necessary to set both the minimum and maximum airflow set points of the controller. The many types of control options available each have specific procedures required for balancing. Refer to the submittal information for these requirements.

SET POINTS

Maximum and minimum airflow set points are normally specified for the job and specific for each unit on the job. Default set point values are provided by the factory and can be reset to the specific requirements in the field. The fan speed must be field adjusted after all discharge ductwork and diffusers have been installed.

<u>FIELD ADJUSTMENT OF THE MAXIMUM AND MINIMUM AIRFLOW SET POINTS</u>

Each fan powered terminal unit is equipped with an airflow sensor installed in the primary air inlet that measures a differential pressure. The relationship between the airflow probe pressure and the corresponding airflow is shown in the airflow sensor graph. See Figure 8. The corresponding chart for specific probe is attached to each unit.

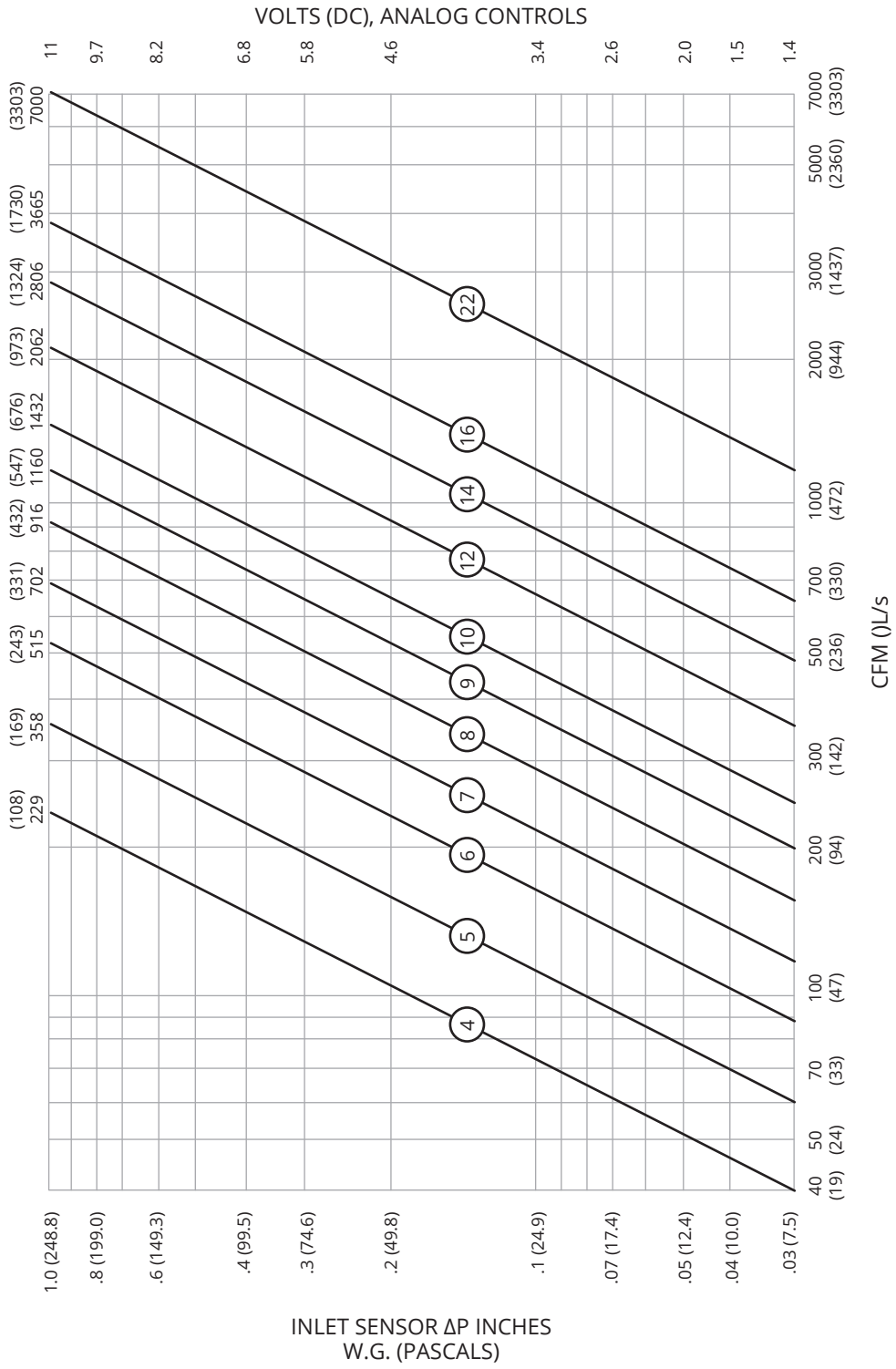


FIGURE 8 – Inlet Airflow Sensor CFM vs. Signal Chart

SYSTEM CALIBRATION OF THE INLET AIRFLOW SENSOR

To achieve efficient pressure independent operation, the velocity sensor and averaging flow probe must be calibrated to the controller. This will ensure that airflow will be accurate for all terminals at system start-up.

System calibration is accomplished by calculating a flow coefficient that adjusts the pressure fpm characteristics. The flow coefficient is determined by dividing the flow for a given unit (design air volume in cfm), at a different velocity pressure of 1.0 in. wg, by the standard pitot tube coefficient of 4005. This ratio is the same for all sizes, if the standard averaging probe is used.

Determine the design air velocity by dividing the design air volume (the flow at 1.0-in. wg) by the nominal inlet area (sq. ft). This factor is the K factor.

Krueger inlet areas are shown in the table. The design air volume is shown in this table. It can be determined from Table 7 that the average design air velocity for units is equal to 2660 fpm at 1.0-in. wg.

TABLE 7 - INLET AREAS

INLET DIAMETER	INLET AREA	CFM @ 1 IN. WG
4"	0.087 ft²	230
5"	0.136 ft²	360
6"	0.196 ft²	515
8"	0.349 ft²	920
10"	0.545 ft²	1430
12"	0.785 ft²	2060
14"	1.069 ft²	2800
16"	1.396 ft²	3660

START-UP

GENERAL

Before balancing the system, the air handlers must be operating in accordance with the specifications for air capacity, static pressure, and temperature. Record data on a unit performance sheet (Figure 9). The following items must be checked:

1. All fans must be running at calculated and specified rpm.
2. Permanent or temporary filters must be clean and installed where required.
3. All central station dampers must be adjusted and operating properly.
4. All thermostats must be calibrated and at the desired settings.
5. All ductwork must be tight.
6. All dirt or loose lining must be removed from inside ductwork.
7. Pumps and sprays, when used, must be in operation.
8. Connections to the coil, when used, must be checked.
9. Water control valve, if used, must be checked.

IMPORTANT: Before proceeding with start-up, be certain that voltage, frequency, and phase correspond to unit specifications. Unless noted, all fan motors are 60 Hz, 115, 208/240, or 277 v, single-phase ac. electric heat, the electric heat voltage may exceed the blower motor voltage requirement. Excessive voltage to the fan box may seriously damage it. Verify that the DDC (if equipped) are receiving 24-v ac, –15%, +20%

INITIAL START-UP PROCEDURES

NOTE: The following steps MUST be followed in order to properly operate and service this unit.

1. Disconnect all electrical power to the unit. Failure to disconnect the power to the fan box prior to checking and/or servicing the fan box could result in a serious injury.
2. Verify that the fan box is installed level, and that adequate mounting support has been provided.
3. Remove motor access panel from the bottom of the fan box, and also remove the control panel cover.
4. Test the fan motor setscrew. The setscrew should fit tightly, but it may have come loose during shipment or installation.
5. Rotate the blower by hand to ensure proper clearance between the blower and the blower housing.
6. Check the fan box for loose fiberglass insulation, especially on the electric heater elements or the hot water coils (if these accessories are installed).
7. Check the control enclosure and remove any debris.
8. Check the induced air inlet filter (if provided) for obstructions, and verify the filter is securely in place.
9. Verify the main power supply to the connection to the fan box for proper voltage. If the fan box is installed with electric heat, the electric heat voltage may exceed the blower motor voltage requirement. Excessive voltage to the fan box may seriously damage it. Verify that the DDC (if equipped) are receiving 24v-ac, –15%, +20%.Identify the control system supplied.
10. Check all control connections (and/or electric) for proper installation.
11. Connect electrical power.

BALANCING KRUEGER FAN TERMINALS

Krueger fan terminal units contain primary air dampers, which, under the control of a volume controller, regulate the amount of cold air distributed to the space.

BALANCING SERIES FLOW UNITS

KLPS, KFSS, KQFS & QFC series flow terminals direct all primary air through the unit fan. The terminal is designed to operate with the fan supplying airflow equal to or greater than the airflow supplied by the VAV damper. To balance the unit, therefore, it is necessary to first set the fan flow, and then the VAV damper (primary) flow.

Each control option has specific procedures required for balancing the unit, but some steps are common to all KLPS, KFSS, KQFS & QFC units. The fan box adjustments described below must be made in conjunction with the adjustments described in the Speed Controller section, and Control Adjustments section. The VAV damper airflow may be set at the factory, but the fan airflow must be set in the field as described below.

SETTING FAN AIRFLOW

NOTE: If the unit has electric heat or hot water heat, temporarily disable these functions before balancing the fan. If unit has optional electric heat disconnect downstream of fan motor connections to power, open disconnect. If unit does not have optional electric heat disconnect, remove one electric heat power line connection. Be sure to insulate loose line from ground wire or other wires.

1. Set the controller to provide heating airflow demand only. Typically, this is accomplished by setting the thermostat to the highest possible temperature setting. NOTE: A minimum of 0.1" w.g. downstream static pressure is required in the duct to ensure proper heater operation.
2. Determine that the VAV valve is fully closed and that the fan is rotating in the proper direction. (If the VAV damper is open when the fan is started and there is primary air in the system, the fan may start and run backward.)
3. Using a flow hood or duct traverse, determine the delivered fan airflow (cfm). **NOTE: Both flow hood and duct traverse are subject to measurement errors. Be sure that all applicable measurement precautions are taken.**
4. Compare the actual cfm in heating mode to the designed airflow. If there is a minimum setting for the VAV damper in heating mode (as recommended by ASHRAE [American Society of Heating, Refrigeration, and Air Conditioning Engineers] Standard 62), this quantity is included in the total measured heating airflow to determine if the desired induction airflow level has been met.
5. Adjust the fan SCR at unit control box to achieve the desired airflow rate. Refer to the performance data tables (Tables 8 and 9) to ensure airflow through electric heaters meets the requirements before operating the heater. Setting of VAV (Primary) Airflow

ADJUSTMENT OF SET POINTS

Each KLPS, KFSS, KQFS and QFC unit, supplied with controls, is equipped with a pneumatic or electronic volume controller which regulates the quantity of cold primary air entering the terminal and the conditioned space. If required airflow levels are specified with the job order, the minimum and maximum cfm levels will be set at the factory where applicable. If minimum and maximum levels are not specified, a default value of 0 is used for minimum setting at the factory. Other settings of minimum and maximum primary airflow must be set in the field. Airflow (cfm) ranges for the primary air damper are shown in Tables 8 and 9. The minimum primary airflow (other than zero) is the minimum flow rate controllable by the unit volume controller. The primary air damper can be set at zero for shutoff or at the minimum cfm listed.

FIELD ADJUSTMENT OF MINIMUM AND MAXIMUM AIRFLOW SET POINTS

Each KLPS, KFSS, KQFS and QFC unit is equipped with a centerpoint averaging airflow sensor, which provides an amplified differential pressure that is proportional to the unit airflow. Output from this sensor is used to provide a flow signal to both pneumatic and electronic controls. Unit airflow (cfm) can be read directly from the airflow sensor labels on the unit (refer to Figure 8, Flow Chart).

1. With the unit airflow from the fan set, turn on primary (VAV) air supply.
2. To set cfm in the field, connect a gage to the flow probe at the provided 'T' taps, and check the differential pressure. (Alternately, the total flow may be measured, and the previously determined fan induction flow rate may be subtracted from the total flow to determine VAV flow. However, for low primary settings, this may not be as accurate as the flow tap method.)
3. If a minimum VAV flow is required in heating mode, adjust the volume until the differential pressure corresponds to the cfm required.
4. Set the controller to provide maximum cooling demand. This is typically accomplished by first setting the thermostat to the lowest possible temperature setting.
   a. In most series fan boxes, the primary airflow rate is set so the maximum primary CFM is equal to the fan CFM; in these cases, adjust the volume controller until a balance is achieved between fan-induced airflow and primary airflow. When a balance exists, a strip of paper hung at the induction port should hang straight down, and neither be blown in or out of the unit.
   b. Primary CFM airflow is less than the fan induction flow cfm, adjust the volume controller until the differential pressure (measured through the flow probe as described above) corresponds to the cfm required. Verify that induction exists through the inlet ports, using the paper strips as described above. When induction exists, the paper strip should be pulled into the unit.
5. Return all reheat options to normal connections.
6. Cap the 'T' taps.
7. Reset the thermostat to a normal setting.

NOTE: It is normal for the total airflow to the room to increase slightly in full cooling mode.

TABLE 8 - UNIT CAPACITY - KFSS FAN TERMINAL UNIT (ECM ONLY)						
UNIT SIZE	INLET SIZE	PRIMARY AIRFLOW		FAN AIRFLOW		MOTOR HP
		MAX	MIN	MAX	MIN	
3	6	515	52 or 0	949	317	1/3
	8	920	92 or 0			
	10	949	143 or 0			
4	8	920	92 or 0	1305	205	1/2
	10	1305	143 or 0			
	12	1305	206 or 0			
5	8	920	92 or 0	1700	591	3/4
	10	1430	143 or 0			
	12	1700	206 or 0			
	14	1700	281 or 0			
6	10	1430	143 or 0	2195	210	1
	12	2060	206 or 0			
	14	2195	281 or 0			
	16	2195	367 or 0			
7	10	1430	143 or 0	3870	684	(2) 3/4
	12	2060	206 or 0			
	14	2800	281 or 0			
	16	3660	367 or 0			

TABLE 9 - UNIT CAPACITY - QFC SERIES FAN TERMINAL UNIT									
UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		PCS MOTOR			ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN	MOTOR HP	MAX FAN	MIN FAN
2	6	515	90	1/10	560	100	N/A		
3	6	515	90	1/4	990	300	1/2	1100	275
	8	920	160						
4	8	920	160	1/4	1440	550	N/A		
	10	1430	250						
	12	1440	360						
5	10	1430	250	1/2	2140	1100	N/A		
	12	2060	360						
6	12	2060	360	3/4	2530	1200	1	2550	650
	14	2530	480						
7	16	3660	630	(2)3/4	3900	2100	(2)1	4550	1125

TABLE 10 - UNIT CAPACITY - KLPS SERIES FAN TERMINAL UNIT									
UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		PCS MOTOR			ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN	MOTOR HP	MAX FAN	MIN FAN
1	4	230	40	N/A			1/3	850	125
	5	350	62						
	6	515	90						
2	6	515	90	N/A			1/3	925	140
	8	860	160						
3	8	920	160	1/4	1075	460	1/3	1125	170
	10	1075	250						
4	10	1425	250	(2)1/6	1650	805	(2)1/3	1900	285
	8x14	1650	360						
5	8	920	160	1/2	1970	840	1/3	1790	265
	10	1425	250						
	12	1970	360						
	14	1970	480						

TABLE 10A - UNIT CAPACITY - KLPS-D SERIES FAN TERMINAL UNIT						
UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN
1	4	230	40	1/3	775	105
	5	350	62			
	6	515	90			
2	4	230	40	1/3	875	135
	5	350	62			
	6	515	90			
3	6	515	90	1/3	1000	150
	8	920	160			
5	6	515	90	1/2	11625	250
	8	920	160			
	10	1430	250			

Note: Minimum Primary airflow may be 0 cfm.

BALANCING PARALLEL FLOW UNITS

The KLPP, KQFP, and QFV parallel fan terminals are designed to operate with the fan supplying air equal to 40 to 60% of the VAV damper maximum primary air setting. Adjustments to the parallel units fan should be made with the primary air closed off. Refer to unit capacity tables to ensure airflow through the electric heater meets the minimum requirements before operating heater.

Each control option has specific procedures required for balancing the unit, but some steps are common to all parallel fan units, as described below.

To balance parallel fan unit:

SETTING FAN AIRFLOW

NOTE: If the unit has electric heat or hot water heat, temporarily disable these functions before balancing the fan.

If unit has optional electric heat disconnect downstream of fan motor connections to power, open disconnect. If unit does not have optional electric heat disconnect, re-move one electric heat power line connection. Be sure to insulate loose line from ground wire or other wires.

1. Set the controller to provide heating airflow demand only. Typically, this is accomplished by setting the thermostat to the highest possible temperature setting.

   NOTE: A minimum of 0.1" w.g. downstream static pressure is required in the duct to ensure proper heater operation.

2. Determine that the VAV damper is fully closed. This may require a temporary override of the VAV controller. Do not adjust minimum and maximum cfm set points at this time.
3. Using a flow hood or duct traverse, determine the delivered fan airflow (cfm).

   NOTE: Both flow hood and duct traverse are subject to measurement errors. Be sure that all applicable measurement precautions are taken.

4. Compare the required design cfm in heating mode to the actual delivered airflow. If there is a minimum setting for the VAV damper in heating mode (as recommended by ASHRAE [American Society of Heating, Refrigeration, and Air Conditioning Engineers] Standard 62), this quantity is included in the total measured airflow.
5. Adjust the fan SCR at unit control box to achieve the desired airflow rate.

SETTING OF VAV (PRIMARY) AIRFLOW

ADJUSTMENT OF SET POINTS

Each parallel fan unit is equipped with a pneumatic or electronic volume controller that regulates the quantity of cold primary air entering the terminal and the conditioned space. If required airflow levels are specified with the job order, the minimum and maximum cfm levels will be set at the factory. If minimum and maximum levels are not specified, a default value is used. Other settings of minimum and maximum primary airflow must be set in the field. Airflow (cfm) ranges for the primary air damper are shown in Tables 11, 12 and 13 for KQFP, QFV and KLPP units. The minimum primary airflow (other than zero) is the minimum flow rate controllable by the unit volume controller. The primary air damper can be set at zero for shutoff or at the minimum cfm listed.

FIELD ADJUSTMENT OF MINIMUM AND MAXIMUM AIRFLOW SET POINTS

Each parallel fan unit is equipped with a four quadrant multi-point center averaging airflow sensor that provides an amplified differential pressure that is proportional to the unit airflow. Output from this probe is used to provide a flow signal to both pneumatic and electronic controls. Unit airflow (cfm) can be read directly from the flow probe on the unit.

1. After the unit airflow from the fan has been set, turn on primary (VAV) air supply and turn off the fan.
2. To set cfm in the field, connect a gage to the flow probe and check the differential pressure.
3. If a minimum VAV flow is required in heating mode, adjust the volume controller until the differential pressure corresponds to the cfm required.
4. Some control sequences allow the fan to start before the VAV damper reaches minimum setting, for an overlapping of fan and VAV flow. For these sequences, after controller min airflow has been adjusted, the total airflow with both fan and primary airflow should be checked. For sequences that call for the fan to start as the first stage of heat, the cooling minimum cfm can be verified at the diffuser. Setting the minimum control point will typically require careful adjustment of the thermostat to create a minimum cooling demand signal.
5. a. Set the controller to provide maximum cooling demand. This is typically accomplished by setting the thermostat to the lowest possible temperature setting. For most control sequences, this will cause the fan to shut off.
   b. Adjust the volume controller until the differential pressure (measured through the flow probe as described above) corresponds to the cfm required.
6. Return all reheat options to normal connections.
7. Cap the ends of the inlet flow sensors.
8. Reset the thermostat to a normal setting.

TABLE 11 - UNIT CAPACITY - KQFP PARALLEL FAN TERMINAL UNIT

UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		PCS MOTOR			ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN	MOTOR HP	MAX FAN	MIN FAN
2	6	515	90	1/4	500	150	N/A		
	8	920	16						
3	6	515	90	1/4	800	160	N/A		
	8	920	160						
	10	1430	250						
4	6	515	90	1/4	900	190	1/2	1000	250
	8	920	160						
	10	1430	250						
	12	2060	360						
5	10	1430	250	1/2	1700	480	N/A		
	12	2060	360						
	14	2800	480						
6	10	1430	250	1/2	1700	500	N/A		
	12	2060	360						
	14	2800	480						
	16	3660	630						
7	10	1430	250	3/4	2000	780	1	1600	400
	12	2060	360						
	14	2800	480						
	16	3660	630						

TABLE 12 - UNIT CAPACITY - QFV PARALLEL FAN TERMINAL UNIT						
UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN
2	6	515	90	1/10	400	200
	8	920	160			
3	8	920	160	1/10	600	300
	10	1430	250			
4	10	1430	250	1/4	1050	480
	12	2060	360			
5	12	2060	360	1/2	1500	860
	14	2800	480			
6	14	2800	480	1/2	1800	930
	16	3660	630			
7	16	3660	630	3/4	2200	1140

TABLE 13 - UNIT CAPACITY - KLPP PARALLEL FAN TERMINAL UNIT									
UNIT SIZE	INLET SIZE	PRIMARY AIR FLOW		PCS MOTOR			ECM MOTOR		
		MAX	MIN	MOTOR HP	MAX FAN	MIN FAN	MOTOR HP	MAX FAN	MIN FAN
2	6	515	90	1/6	665	350	1/3	820	165
	8	920	160						
	10	1430	250						
4	8	920	160	1/4	855	420	1/3	885	175
	10	1430	250						
	8X14	2060	360						

SPEED CONTROLLER

Each Krueger fan powered air terminal unit is equipped with a fan SCR speed controller, located on the bottom of the control box. The SCR can be adjusted in the field. (The QFC, size 7 unit has 2 SCR speed controllers, one for each fan. One SCR is located in the standard position at the bottom of the control box; the other is at the top of the control box.)

CAUTION: The minimum stop on the speed controller is factory set at an internal minimum stop to prevent damage to the motor. Do not attempt to override this minimum stop or electrical damage to the fan motor may result.

The fan airflow output is dependent on the setting of the controller and the downstream static resistance.

TO INCREASE THE FAN SPEED (RPM)

Turn the slotted adjustment on the controller clockwise toward the "HI" marking printed on the controller faceplate. (Refer to Figure 9.)

TO DECREASE THE FAN SPEED (RPM)

Turn the slotted adjustment on the controller clockwise toward the "LO" marking. (Refer to Figure 9.)

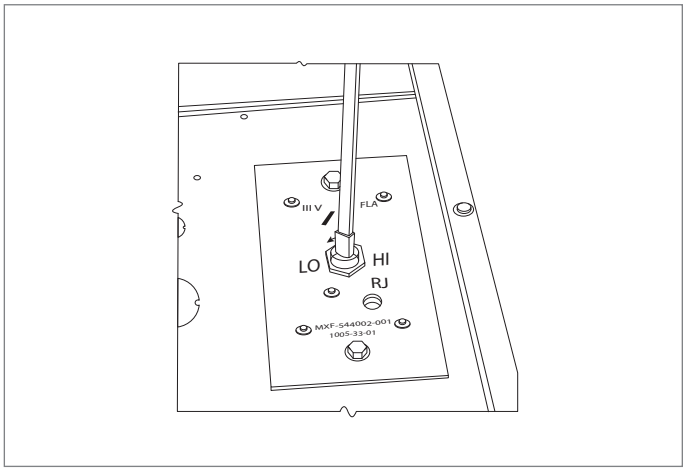


FIGURE 9 – Fan Speed Controller

SETTING FAN AIR FLOW WITH ECM MOTORS

Several terminal unit models are available with ECM motors for easy balancing. These motors supply a determined amount of air regardless of static pressure from ductwork layout or air distribution. The ECM motors are programmed to provide a maximum CFM depending on model and unit size. The motors are then set to provide the desired CFM as a proportional amount of the maximum. The proportion can be set by several options:

MANUAL SPEED CONTROL (CONTROL OPTION 6)

Manual speed controlled units are manually operated with a digital readout on the ECM controller (see Figure 10). The digital readout provides a percent of maximum. A fan adjustment knob is rotated until the desired percent is displayed. After 20 seconds from final adjustment, the controller display will alternate between percent and motor RPM's. See Tables 14-28 for the percent required for desired CFM.

FIGURE 10 –Manual Speed, ECM Controller

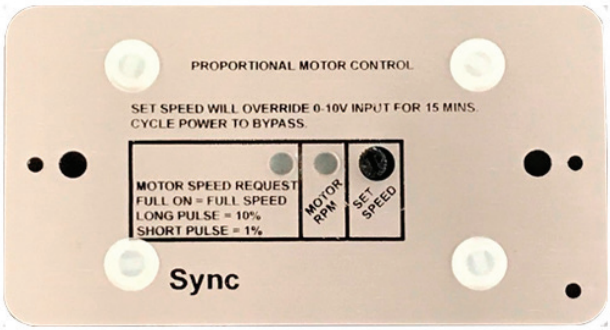
REMOTE SPEED CONTROL, 0-10Vdc (0-20mA) INPUT (CONTROL OPTION 7)

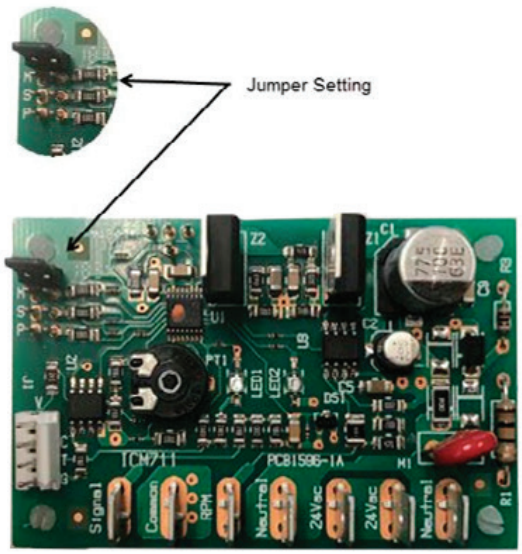
The board is factory set to accept a 0-10Vdc signal to control the airflow between 0% and 100% as shown in the chart in Figure 11. This option does not allow for on/off control. Setting the jumper to the "Opt" position as shown in the "Jumper Setting" in Figure 11 sets the control signal to 0-10Vdc signal.

REMOTE SPEED CONTROL, 2-10Vdc (4-20mA) INPUT (CONTROL OPTION 8)

Another option is to have the board factory set to allow for on/off control by setting the jumper on to the "P" position. This setting uses a 2-10Vdc control signal range with a voltage signal under 2Vdc turning the motor off. See figure 11 for graph of operating range.

Note: Both Remote Speed Control Options provide a manual Override for field setting the ECM motor without being connected to a DDC controller. If a DDC controller is connected, adjusting the manual override will lock out the automation signal for 15 minutes.





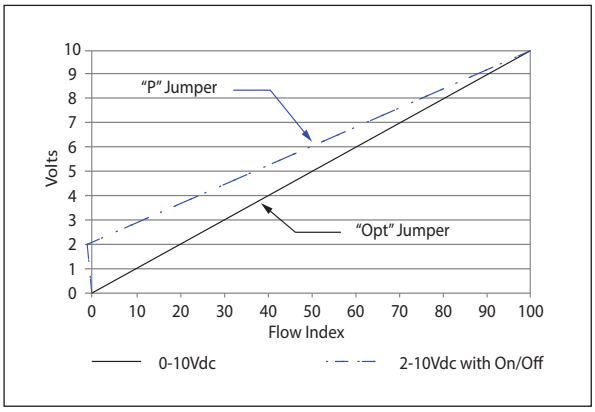


FIGURE 11 – Remote Speed, ECM Controller

TABLE 14 - KQFS / KQFS-FA SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1050	100	10	(20.0)	10	(20.0)
1040	99	9.9	(19.8)	9.9	(19.8)
1029	98	9.8	(19.6)	9.8	(19.7)
1019	97	9.7	(19.4)	9.8	(19.5)
1008	96	9.6	(19.2)	9.7	(19.4)
998	95	9.5	(19.0)	9.6	(19.2)
987	94	9.4	(18.8)	9.5	(19.0)
977	93	9.3	(18.6)	9.4	(18.9)
966	92	9.2	(18.4)	9.4	(18.7)
956	91	9.1	(18.2)	9.3	(18.6)
945	90	9.0	(18.0)	9.2	(18.4)
935	89	8.9	(17.8)	9.1	(18.2)
924	88	8.8	(17.6)	9.0	(18.1)
914	87	8.7	(17.4)	9.0	(17.9)
903	86	8.6	(17.2)	8.9	(17.8)
893	85	8.5	(17.0)	8.8	(17.6)
882	84	8.4	(16.8)	8.7	(17.4)
872	83	8.3	(16.6)	8.6	(17.3)
861	82	8.2	(16.4)	8.6	(17.1)
851	81	8.1	(16.2)	8.5	(17.0)
840	80	8.0	(16.0)	8.4	(16.8)
830	79	7.9	(15.8)	8.3	(16.6)
819	78	7.8	(15.6)	8.2	(16.5)
8.9	77	7.7	(15.4)	8.2	(16.3)
798	76	7.6	(15.2)	8.1	(16.2)
788	75	7.5	(15.0)	8.0	(16.0)
777	74	7.4	(14.8)	7.9	(15.8)
767	73	7.3	(14.6)	7.8	(15.7)
756	72	7.2	(14.2)	7.8	(15.5)
746	71	7.1	(14.0)	7.7	(15.4)
735	70	7.0	(13.8)	7.6	(15.2)
725	69	6.9	(13.6)	7.5	(15.0)
714	68	6.8	(13.6)	7.4	(14.9)
704	67	6.7	(13.4)	7.4	(14.7)
693	66	6.6	(13.2)	7.3	(14.6)
683	65	6.5	(13.0)	7.2	(14.4)
672	64	6.4	(12.8)	7.1	(14.2)
662	63	6.3	(12.6)	7.0	(14.1)
651	62	6.2	(12.4)	7.0	(13.9)
641	61	6.1	(12.2)	6.9	(13.8)
630	60	6.0	(12.0)	6.8	(13.6)
620	59	5.9	(11.8)	6.7	(13.4)
609	58	5.8	(11.6)	6.6	(13.3)
599	57	5.7	(11.4)	6.6	(13.1)
588	56	5.6	(11.2)	6.5	(13.0)
578	55	5.5	(11.0)	6.4	(12.8)
567	54	5.4	(10.8)	6.3	(12.6)
557	53	5.3	(10.6)	6.2	(12.5)
546	52	5.2	(10.4)	6.2	(12.3)
536	51	5.1	(10.2)	6.1	(12.2)

TABLE 14 - KQFS / KQFS-FA SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
525	50	5	(10.0)	6.0	(12.0)
515	49	4.9	(9.8)	5.9	(11.8)
504	48	4.8	(9.6)	5.8	(11.7)
494	47	4.7	(9.4)	5.8	(11.5)
483	46	4.6	(9.2)	5.7	(11.4)
473	45	4.5	(9.0)	5.6	(11.2)
462	44	4.4	(8.8)	5.5	(11.0)
452	43	4.3	(8.6)	5.4	(10.9)
441	42	4.2	(8.4)	5.4	(10.7)
431	41	4.1	(8.2)	5.3	(10.6)
420	40	4	(8.0)	5.2	(10.4)
410	39	3.9	(7.8)	5.1	(10.2)
399	38	3.8	(7.6)	5.0	(10.1)
389	37	3.7	(7.4)	5.0	(9.9)
378	36	3.6	(7.2)	4.9	(9.8)
368	35	3.5	(7.0)	4.8	(9.6)
357	34	3.4	(6.8)	4.7	(9.4)
347	33	3.3	(6.6)	4.6	(9.3)
336	32	3.2	(6.4)	4.6	(9.1)
326	31	3.1	(6.2)	4.5	(9.0)
315	30	3	(6.0)	4.4	(8.8)
305	29	2.9	(5.8)	4.2	(8.6)
294	28	2.8	(5.6)	4.2	(8.5)
284	27	2.7	(5.4)	4.1	(8.3)
273	26	2.6	(5.2)	4.0	(8.2)
263	25	2.5	(5.0)	3.9	(8.0)
252	24	2.4	(4.8)	3.8	(7.8)
242	23	2.3	(4.6)	3.8	(7.7)
231	22	2.2	(4.4)	3.6	(7.5)
221	21	2.1	(4.2)	3.7	(7.4)
210	20	2	(4.0)	3.6	(7.2)
200	19	1.9	(3.8)	3.5	(7.0)
189	18	1.8	(3.6)	3.4	(6.9)
179	17	1.7	(3.4)	3.4	(6.7)
168	16	1.6	(3.2)	3.3	(6.6)
158	15	1.5	(3.0)	3.2	(6.4)
147	14	1.4	(2.8)	3.1	(6.2)
137	13	1.3	(2.6)	3.0	(6.1)
126	12	1.2	(2.4)	3.0	(5.9)
116	11	1.1	(2.2)	2.9	(5.8)
105	10	1	(2.0)	2.8	(5.6)
95	9	0.9	(1.8)	2.7	(5.4)
84	8	0.8	(1.6)	2.6	(5.3)
74	7	0.7	(1.4)	2.6	(5.1)
63	6	0.6	(1.2)	2.5	(5.0)
53	5	0.5	(1.0)	2.4	(4.8)
42	4	0.4	(0.8)	2.3	(4.6)
32	3	0.3	(0.6)	2.2	(4.5)
21	2	0.2	(0.4)	2.2	(4.3)
11	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 15 - KQFS / KQFS-FA SIZE 6 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
2000	100	10	(20.0)	10	(20.0)
1980	99	9.9	(19.8)	9.9	(19.8)
1960	98	9.8	(19.6)	9.8	(19.7)
1940	97	9.7	(19.4)	9.8	(19.5)
1920	96	9.6	(19.2)	9.7	(19.4)
1900	95	9.5	(19.0)	9.6	(19.2)
1880	94	9.4	(18.8)	9.5	(19.0)
1860	93	9.3	(18.6)	9.4	(18.9)
1840	92	9.2	(18.4)	9.4	(18.7)
1820	91	9.1	(18.2)	9.3	(18.6)
1800	90	9.0	(18.0)	9.2	(18.4)
1780	89	8.9	(17.8)	9.1	(18.2)
1760	88	8.8	(17.6)	9.0	(18.1)
1740	87	8.7	(17.4)	9.0	(17.9)
1720	86	8.6	(17.2)	8.9	(17.8)
1700	85	8.5	(17.0)	8.8	(17.6)
1680	84	8.4	(16.8)	8.7	(17.4)
1660	83	8.3	(16.6)	8.6	(17.3)
1640	82	8.2	(16.4)	8.6	(17.1)
1620	81	8.1	(16.2)	8.5	(17.0)
1600	80	8.0	(16.0)	8.4	(16.8)
1580	79	7.9	(15.8)	8.3	(16.6)
1560	78	7.8	(15.6)	8.2	(16.5)
1540	77	7.7	(15.4)	8.2	(16.3)
1520	76	7.6	(15.2)	8.1	(16.2)
1500	75	7.5	(15.0)	8.0	(16.0)
1480	74	7.4	(14.8)	7.9	(15.8)
1460	73	7.3	(14.6)	7.8	(15.7)
1440	72	7.2	(14.2)	7.8	(15.5)
1420	71	7.1	(14.0)	7.7	(15.4)
1400	70	7.0	(13.8)	7.6	(15.2)
1380	69	6.9	(13.6)	7.5	(15.0)
1360	68	6.8	(13.6)	7.4	(14.9)
1340	67	6.7	(13.4)	7.4	(14.7)
1320	66	6.6	(13.2)	7.3	(14.6)
1300	65	6.5	(13.0)	7.2	(14.4)
1280	64	6.4	(12.8)	7.1	(14.2)
1260	63	6.3	(12.6)	7.0	(14.1)
1240	62	6.2	(12.4)	7.0	(13.9)
1220	61	6.1	(12.2)	6.9	(13.8)
1200	60	6.0	(12.0)	6.8	(13.6)
1180	59	5.9	(11.8)	6.7	(13.4)
1160	58	5.8	(11.6)	6.6	(13.3)
1140	57	5.7	(11.4)	6.6	(13.1)
1120	56	5.6	(11.2)	6.5	(13.0)
1100	55	5.5	(11.0)	6.4	(12.8)
1080	54	5.4	(10.8)	6.3	(12.6)
1060	53	5.3	(10.6)	6.2	(12.5)
1040	52	5.2	(10.4)	6.2	(12.3)
1020	51	5.1	(10.2)	6.1	(12.2)

TABLE 15 - KQFS / KQFS-FA SIZE 6 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
100	50	5	(10.0)	6.0	(12.0)
980	49	4.9	(9.8)	5.9	(11.8)
960	48	4.8	(9.6)	5.8	(11.7)
940	47	4.7	(9.4)	5.8	(11.5)
920	46	4.6	(9.2)	5.7	(11.4)
900	45	4.5	(9.0)	5.6	(11.2)
880	44	4.4	(8.8)	5.5	(11.0)
860	43	4.3	(8.6)	5.4	(10.9)
840	42	4.2	(8.4)	5.4	(10.7)
820	41	4.1	(8.2)	5.3	(10.6)
800	40	4	(8.0)	5.2	(10.4)
780	39	3.9	(7.8)	5.1	(10.2)
760	38	3.8	(7.6)	5.0	(10.1)
740	37	3.7	(7.4)	5.0	(9.9)
720	36	3.6	(7.2)	4.9	(9.8)
700	35	3.5	(7.0)	4.8	(9.6)
680	34	3.4	(6.8)	4.7	(9.4)
660	33	3.3	(6.6)	4.6	(9.3)
640	32	3.2	(6.4)	4.6	(9.1)
620	31	3.1	(6.2)	4.5	(9.0)
600	30	3	(6.0)	4.4	(8.8)
580	29	2.9	(5.8)	4.2	(8.6)
560	28	2.8	(5.6)	4.2	(8.5)
540	27	2.7	(5.4)	4.1	(8.3)
520	26	2.6	(5.2)	4.0	(8.2)
500	25	2.5	(5.0)	3.9	(8.0)
480	24	2.4	(4.8)	3.8	(7.8)
460	23	2.3	(4.6)	3.8	(7.7)
440	22	2.2	(4.4)	3.6	(7.5)
420	21	2.1	(4.2)	3.7	(7.4)
400	20	2	(4.0)	3.6	(7.2)
380	19	1.9	(3.8)	3.5	(7.0)
360	18	1.8	(3.6)	3.4	(6.9)
340	17	1.7	(3.4)	3.4	(6.7)
320	16	1.6	(3.2)	3.3	(6.6)
300	15	1.5	(3.0)	3.2	(6.4)
280	14	1.4	(2.8)	3.1	(6.2)
260	13	1.3	(2.6)	3.0	(6.1)
240	12	1.2	(2.4)	3.0	(5.9)
220	11	1.1	(2.2)	2.9	(5.8)
200	10	1	(2.0)	2.8	(5.6)
180	9	0.9	(1.8)	2.7	(5.4)
160	8	0.8	(1.6)	2.6	(5.3)
140	7	0.7	(1.4)	2.6	(5.1)
120	6	0.6	(1.2)	2.5	(5.0)
100	5	0.5	(1.0)	2.4	(4.8)
80	4	0.4	(0.8)	2.3	(4.6)
60	3	0.3	(0.6)	2.2	(4.5)
40	2	0.2	(0.4)	2.2	(4.3)
20	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 16 - KQFS / KQFS-FA SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
2500	100	10	(20.0)	10	(20.0)
2475	99	9.9	(19.8)	9.9	(19.8)
2450	98	9.8	(19.6)	9.8	(19.7)
2425	97	9.7	(19.4)	9.8	(19.5)
2400	96	9.6	(19.2)	9.7	(19.4)
2375	95	9.5	(19.0)	9.6	(19.2)
2350	94	9.4	(18.8)	9.5	(19.0)
2325	93	9.3	(18.6)	9.4	(18.9)
2300	92	9.2	(18.4)	9.4	(18.7)
2275	91	9.1	(18.2)	9.3	(18.6)
2250	90	9.0	(18.0)	9.2	(18.4)
2225	89	8.9	(17.8)	9.1	(18.2)
2200	88	8.8	(17.6)	9.0	(18.1)
2175	87	8.7	(17.4)	9.0	(17.9)
2150	86	8.6	(17.2)	8.9	(17.8)
2125	85	8.5	(17.0)	8.8	(17.6)
2100	84	8.4	(16.8)	8.7	(17.4)
2075	83	8.3	(16.6)	8.6	(17.3)
2050	82	8.2	(16.4)	8.6	(17.1)
2025	81	8.1	(16.2)	8.5	(17.0)
2000	80	8.0	(16.0)	8.4	(16.8)
1975	79	7.9	(15.8)	8.3	(16.6)
1950	78	7.8	(15.6)	8.2	(16.5)
1925	77	7.7	(15.4)	8.2	(16.3)
1900	76	7.6	(15.2)	8.1	(16.2)
1875	75	7.5	(15.0)	8.0	(16.0)
1850	74	7.4	(14.8)	7.9	(15.8)
1825	73	7.3	(14.6)	7.8	(15.7)
1800	72	7.2	(14.2)	7.8	(15.5)
1775	71	7.1	(14.0)	7.7	(15.4)
1750	70	7.0	(13.8)	7.6	(15.2)
1725	69	6.9	(13.6)	7.5	(15.0)
1700	68	6.8	(13.6)	7.4	(14.9)
1675	67	6.7	(13.4)	7.4	(14.7)
1650	66	6.6	(13.2)	7.3	(14.6)
1625	65	6.5	(13.0)	7.2	(14.4)
1600	64	6.4	(12.8)	7.1	(14.2)
1575	63	6.3	(12.6)	7.0	(14.1)
1550	62	6.2	(12.4)	7.0	(13.9)
1525	61	6.1	(12.2)	6.9	(13.8)
1500	60	6.0	(12.0)	6.8	(13.6)
1475	59	5.9	(11.8)	6.7	(13.4)
1450	58	5.8	(11.6)	6.6	(13.3)
1425	57	5.7	(11.4)	6.6	(13.1)
1400	56	5.6	(11.2)	6.5	(13.0)
1375	55	5.5	(11.0)	6.4	(12.8)
1350	54	5.4	(10.8)	6.3	(12.6)
1325	53	5.3	(10.6)	6.2	(12.5)
1300	52	5.2	(10.4)	6.2	(12.3)
1275	51	5.1	(10.2)	6.1	(12.2)

TABLE 16 - KQFS / KQFS-FA SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1250	50	5	(10.0)	6.0	(12.0)
1225	49	4.9	(9.8)	5.9	(11.8)
1200	48	4.8	(9.6)	5.8	(11.7)
1175	47	4.7	(9.4)	5.8	(11.5)
1150	46	4.6	(9.2)	5.7	(11.4)
1125	45	4.5	(9.0)	5.6	(11.2)
1100	44	4.4	(8.8)	5.5	(11.0)
1075	43	4.3	(8.6)	5.4	(10.9)
1050	42	4.2	(8.4)	5.4	(10.7)
1025	41	4.1	(8.2)	5.3	(10.6)
1000	40	4	(8.0)	5.2	(10.4)
975	39	3.9	(7.8)	5.1	(10.2)
950	38	3.8	(7.6)	5.0	(10.1)
925	37	3.7	(7.4)	5.0	(9.9)
900	36	3.6	(7.2)	4.9	(9.8)
875	35	3.5	(7.0)	4.8	(9.6)
850	34	3.4	(6.8)	4.7	(9.4)
825	33	3.3	(6.6)	4.6	(9.3)
800	32	3.2	(6.4)	4.6	(9.1)
775	31	3.1	(6.2)	4.5	(9.0)
750	30	3	(6.0)	4.4	(8.8)
725	29	2.9	(5.8)	4.2	(8.6)
700	28	2.8	(5.6)	4.2	(8.5)
675	27	2.7	(5.4)	4.1	(8.3)
650	26	2.6	(5.2)	4.0	(8.2)
625	25	2.5	(5.0)	3.9	(8.0)
600	24	2.4	(4.8)	3.8	(7.8)
575	23	2.3	(4.6)	3.8	(7.7)
550	22	2.2	(4.4)	3.6	(7.5)
525	21	2.1	(4.2)	3.7	(7.4)
500	20	2	(4.0)	3.6	(7.2)
475	19	1.9	(3.8)	3.5	(7.0)
450	18	1.8	(3.6)	3.4	(6.9)
425	17	1.7	(3.4)	3.4	(6.7)
400	16	1.6	(3.2)	3.3	(6.6)
375	15	1.5	(3.0)	3.2	(6.4)
350	14	1.4	(2.8)	3.1	(6.2)
325	13	1.3	(2.6)	3.0	(6.1)
300	12	1.2	(2.4)	3.0	(5.9)
275	11	1.1	(2.2)	2.9	(5.8)
250	10	1	(2.0)	2.8	(5.6)
225	9	0.9	(1.8)	2.7	(5.4)
200	8	0.8	(1.6)	2.6	(5.3)
175	7	0.7	(1.4)	2.6	(5.1)
150	6	0.6	(1.2)	2.5	(5.0)
125	5	0.5	(1.0)	2.4	(4.8)
100	4	0.4	(0.8)	2.3	(4.6)
75	3	0.3	(0.6)	2.2	(4.5)
50	2	0.2	(0.4)	2.2	(4.3)
25	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 17 - KQFP SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1000	100	10	(20.0)	10	(20.0)
990	99	9.9	(19.8)	9.9	(19.8)
980	98	9.8	(19.6)	9.8	(19.7)
970	97	9.7	(19.4)	9.8	(19.5)
960	96	9.6	(19.2)	9.7	(19.4)
950	95	9.5	(19.0)	9.6	(19.2)
940	94	9.4	(18.8)	9.5	(19.0)
930	93	9.3	(18.6)	9.4	(18.9)
920	92	9.2	(18.4)	9.4	(18.7)
910	91	9.1	(18.2)	9.3	(18.6)
900	90	9.0	(18.0)	9.2	(18.4)
890	89	8.9	(17.8)	9.1	(18.2)
880	88	8.8	(17.6)	9.0	(18.1)
870	87	8.7	(17.4)	9.0	(17.9)
860	86	8.6	(17.2)	8.9	(17.8)
850	85	8.5	(17.0)	8.8	(17.6)
840	84	8.4	(16.8)	8.7	(17.4)
830	83	8.3	(16.6)	8.6	(17.3)
820	82	8.2	(16.4)	8.6	(17.1)
810	81	8.1	(16.2)	8.5	(17.0)
800	80	8.0	(16.0)	8.4	(16.8)
790	79	7.9	(15.8)	8.3	(16.6)
780	78	7.8	(15.6)	8.2	(16.5)
770	77	7.7	(15.4)	8.2	(16.3)
760	76	7.6	(15.2)	8.1	(16.2)
750	75	7.5	(15.0)	8.0	(16.0)
740	74	7.4	(14.8)	7.9	(15.8)
730	73	7.3	(14.6)	7.8	(15.7)
720	72	7.2	(14.2)	7.8	(15.5)
710	71	7.1	(14.0)	7.7	(15.4)
700	70	7.0	(13.8)	7.6	(15.2)
690	69	6.9	(13.6)	7.5	(15.0)
680	68	6.8	(13.6)	7.4	(14.9)
670	67	6.7	(13.4)	7.4	(14.7)
660	66	6.6	(13.2)	7.3	(14.6)
650	65	6.5	(13.0)	7.2	(14.4)
640	64	6.4	(12.8)	7.1	(14.2)
630	63	6.3	(12.6)	7.0	(14.1)
620	62	6.2	(12.4)	7.0	(13.9)
610	61	6.1	(12.2)	6.9	(13.8)
600	60	6.0	(12.0)	6.8	(13.6)
590	59	5.9	(11.8)	6.7	(13.4)
580	58	5.8	(11.6)	6.6	(13.3)
570	57	5.7	(11.4)	6.6	(13.1)
560	56	5.6	(11.2)	6.5	(13.0)
550	55	5.5	(11.0)	6.4	(12.8)
540	54	5.4	(10.8)	6.3	(12.6)
530	53	5.3	(10.6)	6.2	(12.5)
20	52	5.2	(10.4)	6.2	(12.3)
510	51	5.1	(10.2)	6.1	(12.2)

TABLE 17 - KQFP SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
500	50	5	(10.0)	6.0	(12.0)
490	49	4.9	(9.8)	5.9	(11.8)
480	48	4.8	(9.6)	5.8	(11.7)
470	47	4.7	(9.4)	5.8	(11.5)
460	46	4.6	(9.2)	5.7	(11.4)
450	45	4.5	(9.0)	5.6	(11.2)
440	44	4.4	(8.8)	5.5	(11.0)
430	43	4.3	(8.6)	5.4	(10.9)
420	42	4.2	(8.4)	5.4	(10.7)
410	41	4.1	(8.2)	5.3	(10.6)
400	40	4	(8.0)	5.2	(10.4)
390	39	3.9	(7.8)	5.1	(10.2)
380	38	3.8	(7.6)	5.0	(10.1)
370	37	3.7	(7.4)	5.0	(9.9)
360	36	3.6	(7.2)	4.9	(9.8)
350	35	3.5	(7.0)	4.8	(9.6)
340	34	3.4	(6.8)	4.7	(9.4)
330	33	3.3	(6.6)	4.6	(9.3)
320	32	3.2	(6.4)	4.6	(9.1)
310	31	3.1	(6.2)	4.5	(9.0)
300	30	3	(6.0)	4.4	(8.8)
290	29	2.9	(5.8)	4.2	(8.6)
280	28	2.8	(5.6)	4.2	(8.5)
270	27	2.7	(5.4)	4.1	(8.3)
260	26	2.6	(5.2)	4.0	(8.2)
250	25	2.5	(5.0)	3.9	(8.0)
240	24	2.4	(4.8)	3.8	(7.8)
230	23	2.3	(4.6)	3.8	(7.7)
220	22	2.2	(4.4)	3.6	(7.5)
210	21	2.1	(4.2)	3.7	(7.4)
200	20	2	(4.0)	3.6	(7.2)
190	19	1.9	(3.8)	3.5	(7.0)
180	18	1.8	(3.6)	3.4	(6.9)
170	17	1.7	(3.4)	3.4	(6.7)
160	16	1.6	(3.2)	3.3	(6.6)
150	15	1.5	(3.0)	3.2	(6.4)
140	14	1.4	(2.8)	3.1	(6.2)
130	13	1.3	(2.6)	3.0	(6.1)
120	12	1.2	(2.4)	3.0	(5.9)
110	11	1.1	(2.2)	2.9	(5.8)
100	10	1	(2.0)	2.8	(5.6)
90	9	0.9	(1.8)	2.7	(5.4)
80	8	0.8	(1.6)	2.6	(5.3)
70	7	0.7	(1.4)	2.6	(5.1)
60	6	0.6	(1.2)	2.5	(5.0)
50	5	0.5	(1.0)	2.4	(4.8)
40	4	0.4	(0.8)	2.3	(4.6)
30	3	0.3	(0.6)	2.2	(4.5)
20	2	0.2	(0.4)	2.2	(4.3)
10	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 18 - KQFP SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1000	100	10	(20.0)	10	(20.0)
990	99	9.9	(19.8)	9.9	(19.8)
980	98	9.8	(19.6)	9.8	(19.7)
970	97	9.7	(19.4)	9.8	(19.5)
960	96	9.6	(19.2)	9.7	(19.4)
950	95	9.5	(19.0)	9.6	(19.2)
940	94	9.4	(18.8)	9.5	(19.0)
930	93	9.3	(18.6)	9.4	(18.9)
920	92	9.2	(18.4)	9.4	(18.7)
910	91	9.1	(18.2)	9.3	(18.6)
900	90	9.0	(18.0)	9.2	(18.4)
890	89	8.9	(17.8)	9.1	(18.2)
880	88	8.8	(17.6)	9.0	(18.1)
870	87	8.7	(17.4)	9.0	(17.9)
860	86	8.6	(17.2)	8.9	(17.8)
850	85	8.5	(17.0)	8.8	(17.6)
840	84	8.4	(16.8)	8.7	(17.4)
830	83	8.3	(16.6)	8.6	(17.3)
820	82	8.2	(16.4)	8.6	(17.1)
810	81	8.1	(16.2)	8.5	(17.0)
800	80	8.0	(16.0)	8.4	(16.8)
790	79	7.9	(15.8)	8.3	(16.6)
780	78	7.8	(15.6)	8.2	(16.5)
770	77	7.7	(15.4)	8.2	(16.3)
760	76	7.6	(15.2)	8.1	(16.2)
750	75	7.5	(15.0)	8.0	(16.0)
740	74	7.4	(14.8)	7.9	(15.8)
730	73	7.3	(14.6)	7.8	(15.7)
720	72	7.2	(14.2)	7.8	(15.5)
710	71	7.1	(14.0)	7.7	(15.4)
700	70	7.0	(13.8)	7.6	(15.2)
690	69	6.9	(13.6)	7.5	(15.0)
680	68	6.8	(13.6)	7.4	(14.9)
670	67	6.7	(13.4)	7.4	(14.7)
660	66	6.6	(13.2)	7.3	(14.6)
650	65	6.5	(13.0)	7.2	(14.4)
640	64	6.4	(12.8)	7.1	(14.2)
630	63	6.3	(12.6)	7.0	(14.1)
620	62	6.2	(12.4)	7.0	(13.9)
610	61	6.1	(12.2)	6.9	(13.8)
600	60	6.0	(12.0)	6.8	(13.6)
590	59	5.9	(11.8)	6.7	(13.4)
580	58	5.8	(11.6)	6.6	(13.3)
570	57	5.7	(11.4)	6.6	(13.1)
560	56	5.6	(11.2)	6.5	(13.0)
550	55	5.5	(11.0)	6.4	(12.8)
540	54	5.4	(10.8)	6.3	(12.6)
530	53	5.3	(10.6)	6.2	(12.5)
20	52	5.2	(10.4)	6.2	(12.3)
510	51	5.1	(10.2)	6.1	(12.2)

TABLE 18 - KQFP SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
500	50	5	(10.0)	6.0	(12.0)
490	49	4.9	(9.8)	5.9	(11.8)
480	48	4.8	(9.6)	5.8	(11.7)
470	47	4.7	(9.4)	5.8	(11.5)
460	46	4.6	(9.2)	5.7	(11.4)
450	45	4.5	(9.0)	5.6	(11.2)
440	44	4.4	(8.8)	5.5	(11.0)
430	43	4.3	(8.6)	5.4	(10.9)
420	42	4.2	(8.4)	5.4	(10.7)
410	41	4.1	(8.2)	5.3	(10.6)
400	40	4	(8.0)	5.2	(10.4)
390	39	3.9	(7.8)	5.1	(10.2)
380	38	3.8	(7.6)	5.0	(10.1)
370	37	3.7	(7.4)	5.0	(9.9)
360	36	3.6	(7.2)	4.9	(9.8)
350	35	3.5	(7.0)	4.8	(9.6)
340	34	3.4	(6.8)	4.7	(9.4)
330	33	3.3	(6.6)	4.6	(9.3)
320	32	3.2	(6.4)	4.6	(9.1)
310	31	3.1	(6.2)	4.5	(9.0)
300	30	3	(6.0)	4.4	(8.8)
290	29	2.9	(5.8)	4.2	(8.6)
280	28	2.8	(5.6)	4.2	(8.5)
270	27	2.7	(5.4)	4.1	(8.3)
260	26	2.6	(5.2)	4.0	(8.2)
250	25	2.5	(5.0)	3.9	(8.0)
240	24	2.4	(4.8)	3.8	(7.8)
230	23	2.3	(4.6)	3.8	(7.7)
220	22	2.2	(4.4)	3.6	(7.5)
210	21	2.1	(4.2)	3.7	(7.4)
200	20	2	(4.0)	3.6	(7.2)
190	19	1.9	(3.8)	3.5	(7.0)
180	18	1.8	(3.6)	3.4	(6.9)
170	17	1.7	(3.4)	3.4	(6.7)
160	16	1.6	(3.2)	3.3	(6.6)
150	15	1.5	(3.0)	3.2	(6.4)
140	14	1.4	(2.8)	3.1	(6.2)
130	13	1.3	(2.6)	3.0	(6.1)
120	12	1.2	(2.4)	3.0	(5.9)
110	11	1.1	(2.2)	2.9	(5.8)
100	10	1	(2.0)	2.8	(5.6)
90	9	0.9	(1.8)	2.7	(5.4)
80	8	0.8	(1.6)	2.6	(5.3)
70	7	0.7	(1.4)	2.6	(5.1)
60	6	0.6	(1.2)	2.5	(5.0)
50	5	0.5	(1.0)	2.4	(4.8)
40	4	0.4	(0.8)	2.3	(4.6)
30	3	0.3	(0.6)	2.2	(4.5)
20	2	0.2	(0.4)	2.2	(4.3)
10	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 19 - QFC SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1100	100	10	(20.0)	10	(20.0)
1089	99	9.9	(19.8)	9.9	(19.8)
1078	98	9.8	(19.6)	9.8	(19.7)
1067	97	9.7	(19.4)	9.8	(19.5)
1056	96	9.6	(19.2)	9.7	(19.4)
1045	95	9.5	(19.0)	9.6	(19.2)
1034	94	9.4	(18.8)	9.5	(19.0)
1023	93	9.3	(18.6)	9.4	(18.9)
1012	92	9.2	(18.4)	9.4	(18.7)
1001	91	9.1	(18.2)	9.3	(18.6)
990	90	9.0	(18.0)	9.2	(18.4)
979	89	8.9	(17.8)	9.1	(18.2)
968	88	8.8	(17.6)	9.0	(18.1)
957	87	8.7	(17.4)	9.0	(17.9)
946	86	8.6	(17.2)	8.9	(17.8)
935	85	8.5	(17.0)	8.8	(17.6)
924	84	8.4	(16.8)	8.7	(17.4)
913	83	8.3	(16.6)	8.6	(17.3)
902	82	8.2	(16.4)	8.6	(17.1)
891	81	8.1	(16.2)	8.5	(17.0)
880	80	8.0	(16.0)	8.4	(16.8)
869	79	7.9	(15.8)	8.3	(16.6)
858	78	7.8	(15.6)	8.2	(16.5)
847	77	7.7	(15.4)	8.2	(16.3)
836	76	7.6	(15.2)	8.1	(16.2)
825	75	7.5	(15.0)	8.0	(16.0)
814	74	7.4	(14.8)	7.9	(15.8)
803	73	7.3	(14.6)	7.8	(15.7)
792	72	7.2	(14.2)	7.8	(15.5)
781	71	7.1	(14.0)	7.7	(15.4)
770	70	7.0	(13.8)	7.6	(15.2)
759	69	6.9	(13.6)	7.5	(15.0)
748	68	6.8	(13.6)	7.4	(14.9)
737	67	6.7	(13.4)	7.4	(14.7)
726	66	6.6	(13.2)	7.3	(14.6)
715	65	6.5	(13.0)	7.2	(14.4)
704	64	6.4	(12.8)	7.1	(14.2)
693	63	6.3	(12.6)	7.0	(14.1)
682	62	6.2	(12.4)	7.0	(13.9)
671	61	6.1	(12.2)	6.9	(13.8)
660	60	6.0	(12.0)	6.8	(13.6)
649	59	5.9	(11.8)	6.7	(13.4)
638	58	5.8	(11.6)	6.6	(13.3)
627	57	5.7	(11.4)	6.6	(13.1)
616	56	5.6	(11.2)	6.5	(13.0)
605	55	5.5	(11.0)	6.4	(12.8)
594	54	5.4	(10.8)	6.3	(12.6)
583	53	5.3	(10.6)	6.2	(12.5)
572	52	5.2	(10.4)	6.2	(12.3)
561	51	5.1	(10.2)	6.1	(12.2)

TABLE 19 - QFC SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
550	50	5	(10.0)	6.0	(12.0)
539	49	4.9	(9.8)	5.9	(11.8)
528	48	4.8	(9.6)	5.8	(11.7)
517	47	4.7	(9.4)	5.8	(11.5)
506	46	4.6	(9.2)	5.7	(11.4)
495	45	4.5	(9.0)	5.6	(11.2)
484	44	4.4	(8.8)	5.5	(11.0)
473	43	4.3	(8.6)	5.4	(10.9)
462	42	4.2	(8.4)	5.4	(10.7)
451	41	4.1	(8.2)	5.3	(10.6)
440	40	4	(8.0)	5.2	(10.4)
429	39	3.9	(7.8)	5.1	(10.2)
418	38	3.8	(7.6)	5.0	(10.1)
407	37	3.7	(7.4)	5.0	(9.9)
396	36	3.6	(7.2)	4.9	(9.8)
385	35	3.5	(7.0)	4.8	(9.6)
374	34	3.4	(6.8)	4.7	(9.4)
363	33	3.3	(6.6)	4.6	(9.3)
352	32	3.2	(6.4)	4.6	(9.1)
341	31	3.1	(6.2)	4.5	(9.0)
330	30	3	(6.0)	4.4	(8.8)
319	29	2.9	(5.8)	4.2	(8.6)
308	28	2.8	(5.6)	4.2	(8.5)
297	27	2.7	(5.4)	4.1	(8.3)
286	26	2.6	(5.2)	4.0	(8.2)
275	25	2.5	(5.0)	3.9	(8.0)
264	24	2.4	(4.8)	3.8	(7.8)
253	23	2.3	(4.6)	3.8	(7.7)
242	22	2.2	(4.4)	3.6	(7.5)
231	21	2.1	(4.2)	3.7	(7.4)
220	20	2	(4.0)	3.6	(7.2)
209	19	1.9	(3.8)	3.5	(7.0)
198	18	1.8	(3.6)	3.4	(6.9)
187	17	1.7	(3.4)	3.4	(6.7)
176	16	1.6	(3.2)	3.3	(6.6)
165	15	1.5	(3.0)	3.2	(6.4)
154	14	1.4	(2.8)	3.1	(6.2)
143	13	1.3	(2.6)	3.0	(6.1)
132	12	1.2	(2.4)	3.0	(5.9)
121	11	1.1	(2.2)	2.9	(5.8)
110	10	1	(2.0)	2.8	(5.6)
99	9	0.9	(1.8)	2.7	(5.4)
88	8	0.8	(1.6)	2.6	(5.3)
77	7	0.7	(1.4)	2.6	(5.1)
66	6	0.6	(1.2)	2.5	(5.0)
55	5	0.5	(1.0)	2.4	(4.8)
44	4	0.4	(0.8)	2.3	(4.6)
33	3	0.3	(0.6)	2.2	(4.5)
22	2	0.2	(0.4)	2.2	(4.3)
11	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 20 - QFC SIZE 6 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
2550	100	10	(20.0)	10	(20.0)
2525	99	9.9	(19.8)	9.9	(19.8)
2499	98	9.8	(19.6)	9.8	(19.7)
2474	97	9.7	(19.4)	9.8	(19.5)
2448	96	9.6	(19.2)	9.7	(19.4)
2423	95	9.5	(19.0)	9.6	(19.2)
2397	94	9.4	(18.8)	9.5	(19.0)
2372	93	9.3	(18.6)	9.4	(18.9)
2346	92	9.2	(18.4)	9.4	(18.7)
2321	91	9.1	(18.2)	9.3	(18.6)
2295	90	9.0	(18.0)	9.2	(18.4)
2270	89	8.9	(17.8)	9.1	(18.2)
2244	88	8.8	(17.6)	9.0	(18.1)
2219	87	8.7	(17.4)	9.0	(17.9)
2193	86	8.6	(17.2)	8.9	(17.8)
2168	85	8.5	(17.0)	8.8	(17.6)
2142	84	8.4	(16.8)	8.7	(17.4)
2117	83	8.3	(16.6)	8.6	(17.3)
2091	82	8.2	(16.4)	8.6	(17.1)
2066	81	8.1	(16.2)	8.5	(17.0)
2040	80	8.0	(16.0)	8.4	(16.8)
2015	79	7.9	(15.8)	8.3	(16.6)
1989	78	7.8	(15.6)	8.2	(16.5)
1964	77	7.7	(15.4)	8.2	(16.3)
1938	76	7.6	(15.2)	8.1	(16.2)
1913	75	7.5	(15.0)	8.0	(16.0)
1887	74	7.4	(14.8)	7.9	(15.8)
1862	73	7.3	(14.6)	7.8	(15.7)
1836	72	7.2	(14.2)	7.8	(15.5)
1811	71	7.1	(14.0)	7.7	(15.4)
1785	70	7.0	(13.8)	7.6	(15.2)
1760	69	6.9	(13.6)	7.5	(15.0)
1734	68	6.8	(13.6)	7.4	(14.9)
1709	67	6.7	(13.4)	7.4	(14.7)
1683	66	6.6	(13.2)	7.3	(14.6)
1658	65	6.5	(13.0)	7.2	(14.4)
1632	64	6.4	(12.8)	7.1	(14.2)
1607	63	6.3	(12.6)	7.0	(14.1)
1581	62	6.2	(12.4)	7.0	(13.9)
1556	61	6.1	(12.2)	6.9	(13.8)
1530	60	6.0	(12.0)	6.8	(13.6)
1505	59	5.9	(11.8)	6.7	(13.4)
1479	58	5.8	(11.6)	6.6	(13.3)
1454	57	5.7	(11.4)	6.6	(13.1)
1428	56	5.6	(11.2)	6.5	(13.0)
1403	55	5.5	(11.0)	6.4	(12.8)
1377	54	5.4	(10.8)	6.3	(12.6)
1352	53	5.3	(10.6)	6.2	(12.5)
1326	52	5.2	(10.4)	6.2	(12.3)
1301	51	5.1	(10.2)	6.1	(12.2)

TABLE 20 - QFC SIZE 6 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1275	50	5	(10.0)	6.0	(12.0)
1250	49	4.9	(9.8)	5.9	(11.8)
1224	48	4.8	(9.6)	5.8	(11.7)
1199	47	4.7	(9.4)	5.8	(11.5)
1173	46	4.6	(9.2)	5.7	(11.4)
1148	45	4.5	(9.0)	5.6	(11.2)
1122	44	4.4	(8.8)	5.5	(11.0)
1097	43	4.3	(8.6)	5.4	(10.9)
1071	42	4.2	(8.4)	5.4	(10.7)
1046	41	4.1	(8.2)	5.3	(10.6)
1020	40	4	(8.0)	5.2	(10.4)
995	39	3.9	(7.8)	5.1	(10.2)
969	38	3.8	(7.6)	5.0	(10.1)
944	37	3.7	(7.4)	5.0	(9.9)
918	36	3.6	(7.2)	4.9	(9.8)
893	35	3.5	(7.0)	4.8	(9.6)
867	34	3.4	(6.8)	4.7	(9.4)
842	33	3.3	(6.6)	4.6	(9.3)
816	32	3.2	(6.4)	4.6	(9.1)
791	31	3.1	(6.2)	4.5	(9.0)
765	30	3	(6.0)	4.4	(8.8)
740	29	2.9	(5.8)	4.2	(8.6)
714	28	2.8	(5.6)	4.2	(8.5)
689	27	2.7	(5.4)	4.1	(8.3)
663	26	2.6	(5.2)	4.0	(8.2)
638	25	2.5	(5.0)	3.9	(8.0)
612	24	2.4	(4.8)	3.8	(7.8)
587	23	2.3	(4.6)	3.8	(7.7)
561	22	2.2	(4.4)	3.6	(7.5)
536	21	2.1	(4.2)	3.7	(7.4)
510	20	2	(4.0)	3.6	(7.2)
485	19	1.9	(3.8)	3.5	(7.0)
459	18	1.8	(3.6)	3.4	(6.9)
434	17	1.7	(3.4)	3.4	(6.7)
408	16	1.6	(3.2)	3.3	(6.6)
383	15	1.5	(3.0)	3.2	(6.4)
357	14	1.4	(2.8)	3.1	(6.2)
332	13	1.3	(2.6)	3.0	(6.1)
306	12	1.2	(2.4)	3.0	(5.9)
281	11	1.1	(2.2)	2.9	(5.8)
255	10	1	(2.0)	2.8	(5.6)
230	9	0.9	(1.8)	2.7	(5.4)
204	8	0.8	(1.6)	2.6	(5.3)
179	7	0.7	(1.4)	2.6	(5.1)
153	6	0.6	(1.2)	2.5	(5.0)
128	5	0.5	(1.0)	2.4	(4.8)
102	4	0.4	(0.8)	2.3	(4.6)
77	3	0.3	(0.6)	2.2	(4.5)
51	2	0.2	(0.4)	2.2	(4.3)
26	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 21 - QFC SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
4550	100	10	(20.0)	10	(20.0)
4505	99	9.9	(19.8)	9.9	(19.8)
4459	98	9.8	(19.6)	9.8	(19.7)
4414	97	9.7	(19.4)	9.8	(19.5)
4368	96	9.6	(19.2)	9.7	(19.4)
4323	95	9.5	(19.0)	9.6	(19.2)
4277	94	9.4	(18.8)	9.5	(19.0)
4232	93	9.3	(18.6)	9.4	(18.9)
4186	92	9.2	(18.4)	9.4	(18.7)
4141	91	9.1	(18.2)	9.3	(18.6)
4095	90	9.0	(18.0)	9.2	(18.4)
4050	89	8.9	(17.8)	9.1	(18.2)
4004	88	8.8	(17.6)	9.0	(18.1)
3959	87	8.7	(17.4)	9.0	(17.9)
3913	86	8.6	(17.2)	8.9	(17.8)
3868	85	8.5	(17.0)	8.8	(17.6)
3822	84	8.4	(16.8)	8.7	(17.4)
3777	83	8.3	(16.6)	8.6	(17.3)
3731	82	8.2	(16.4)	8.6	(17.1)
3686	81	8.1	(16.2)	8.5	(17.0)
3640	80	8.0	(16.0)	8.4	(16.8)
3595	79	7.9	(15.8)	8.3	(16.6)
3549	78	7.8	(15.6)	8.2	(16.5)
3504	77	7.7	(15.4)	8.2	(16.3)
3458	76	7.6	(15.2)	8.1	(16.2)
3413	75	7.5	(15.0)	8.0	(16.0)
3367	74	7.4	(14.8)	7.9	(15.8)
3322	73	7.3	(14.6)	7.8	(15.7)
3276	72	7.2	(14.2)	7.8	(15.5)
3231	71	7.1	(14.0)	7.7	(15.4)
3185	70	7.0	(13.8)	7.6	(15.2)
3140	69	6.9	(13.6)	7.5	(15.0)
3094	68	6.8	(13.6)	7.4	(14.9)
3049	67	6.7	(13.4)	7.4	(14.7)
3003	66	6.6	(13.2)	7.3	(14.6)
2958	65	6.5	(13.0)	7.2	(14.4)
2912	64	6.4	(12.8)	7.1	(14.2)
2867	63	6.3	(12.6)	7.0	(14.1)
2821	62	6.2	(12.4)	7.0	(13.9)
2776	61	6.1	(12.2)	6.9	(13.8)
2730	60	6.0	(12.0)	6.8	(13.6)
2685	59	5.9	(11.8)	6.7	(13.4)
2639	58	5.8	(11.6)	6.6	(13.3)
2594	57	5.7	(11.4)	6.6	(13.1)
2548	56	5.6	(11.2)	6.5	(13.0)
2503	55	5.5	(11.0)	6.4	(12.8)
2457	54	5.4	(10.8)	6.3	(12.6)
2412	53	5.3	(10.6)	6.2	(12.5)
2366	52	5.2	(10.4)	6.2	(12.3)
2321	51	5.1	(10.2)	6.1	(12.2)

TABLE 21 - QFC SIZE 7 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
2275	50	5	(10.0)	6.0	(12.0)
2230	49	4.9	(9.8)	5.9	(11.8)
2184	48	4.8	(9.6)	5.8	(11.7)
2139	47	4.7	(9.4)	5.8	(11.5)
2093	46	4.6	(9.2)	5.7	(11.4)
2048	45	4.5	(9.0)	5.6	(11.2)
2002	44	4.4	(8.8)	5.5	(11.0)
1957	43	4.3	(8.6)	5.4	(10.9)
1911	42	4.2	(8.4)	5.4	(10.7)
1866	41	4.1	(8.2)	5.3	(10.6)
1820	40	4	(8.0)	5.2	(10.4)
1775	39	3.9	(7.8)	5.1	(10.2)
1729	38	3.8	(7.6)	5.0	(10.1)
1684	37	3.7	(7.4)	5.0	(9.9)
1638	36	3.6	(7.2)	4.9	(9.8)
1593	35	3.5	(7.0)	4.8	(9.6)
1547	34	3.4	(6.8)	4.7	(9.4)
1502	33	3.3	(6.6)	4.6	(9.3)
1456	32	3.2	(6.4)	4.6	(9.1)
1411	31	3.1	(6.2)	4.5	(9.0)
1365	30	3	(6.0)	4.4	(8.8)
1320	29	2.9	(5.8)	4.2	(8.6)
1274	28	2.8	(5.6)	4.2	(8.5)
1229	27	2.7	(5.4)	4.1	(8.3)
1183	26	2.6	(5.2)	4.0	(8.2)
1138	25	2.5	(5.0)	3.9	(8.0)
1092	24	2.4	(4.8)	3.8	(7.8)
1047	23	2.3	(4.6)	3.8	(7.7)
1001	22	2.2	(4.4)	3.6	(7.5)
956	21	2.1	(4.2)	3.7	(7.4)
910	20	2	(4.0)	3.6	(7.2)
865	19	1.9	(3.8)	3.5	(7.0)
819	18	1.8	(3.6)	3.4	(6.9)
774	17	1.7	(3.4)	3.4	(6.7)
728	16	1.6	(3.2)	3.3	(6.6)
683	15	1.5	(3.0)	3.2	(6.4)
637	14	1.4	(2.8)	3.1	(6.2)
592	13	1.3	(2.6)	3.0	(6.1)
546	12	1.2	(2.4)	3.0	(5.9)
501	11	1.1	(2.2)	2.9	(5.8)
455	10	1	(2.0)	2.8	(5.6)
410	9	0.9	(1.8)	2.7	(5.4)
364	8	0.8	(1.6)	2.6	(5.3)
319	7	0.7	(1.4)	2.6	(5.1)
273	6	0.6	(1.2)	2.5	(5.0)
228	5	0.5	(1.0)	2.4	(4.8)
182	4	0.4	(0.8)	2.3	(4.6)
137	3	0.3	(0.6)	2.2	(4.5)
91	2	0.2	(0.4)	2.2	(4.3)
46	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 22 - KLPS SIZE 1 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
850	100	10	(20.0)	10	(20.0)
842	99	9.9	(19.8)	9.9	(19.8)
833	98	9.8	(19.6)	9.8	(19.7)
825	97	9.7	(19.4)	9.8	(19.5)
816	96	9.6	(19.2)	9.7	(19.4)
808	95	9.5	(19.0)	9.6	(19.2)
799	94	9.4	(18.8)	9.5	(19.0)
791	93	9.3	(18.6)	9.4	(18.9)
782	92	9.2	(18.4)	9.4	(18.7)
774	91	9.1	(18.2)	9.3	(18.6)
765	90	9.0	(18.0)	9.2	(18.4)
757	89	8.9	(17.8)	9.1	(18.2)
748	88	8.8	(17.6)	9.0	(18.1)
740	87	8.7	(17.4)	9.0	(17.9)
731	86	8.6	(17.2)	8.9	(17.8)
723	85	8.5	(17.0)	8.8	(17.6)
714	84	8.4	(16.8)	8.7	(17.4)
706	83	8.3	(16.6)	8.6	(17.3)
697	82	8.2	(16.4)	8.6	(17.1)
689	81	8.1	(16.2)	8.5	(17.0)
680	80	8.0	(16.0)	8.4	(16.8)
672	79	7.9	(15.8)	8.3	(16.6)
663	78	7.8	(15.6)	8.2	(16.5)
655	77	7.7	(15.4)	8.2	(16.3)
646	76	7.6	(15.2)	8.1	(16.2)
638	75	7.5	(15.0)	8.0	(16.0)
629	74	7.4	(14.8)	7.9	(15.8)
621	73	7.3	(14.6)	7.8	(15.7)
612	72	7.2	(14.2)	7.8	(15.5)
604	71	7.1	(14.0)	7.7	(15.4)
595	70	7.0	(13.8)	7.6	(15.2)
587	69	6.9	(13.6)	7.5	(15.0)
578	68	6.8	(13.6)	7.4	(14.9)
570	67	6.7	(13.4)	7.4	(14.7)
561	66	6.6	(13.2)	7.3	(14.6)
553	65	6.5	(13.0)	7.2	(14.4)
544	64	6.4	(12.8)	7.1	(14.2)
536	63	6.3	(12.6)	7.0	(14.1)
527	62	6.2	(12.4)	7.0	(13.9)
519	61	6.1	(12.2)	6.9	(13.8)
510	60	6.0	(12.0)	6.8	(13.6)
502	59	5.9	(11.8)	6.7	(13.4)
493	58	5.8	(11.6)	6.6	(13.3)
485	57	5.7	(11.4)	6.6	(13.1)
476	56	5.6	(11.2)	6.5	(13.0)
468	55	5.5	(11.0)	6.4	(12.8)
459	54	5.4	(10.8)	6.3	(12.6)
451	53	5.3	(10.6)	6.2	(12.5)
442	52	5.2	(10.4)	6.2	(12.3)
434	51	5.1	(10.2)	6.1	(12.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 22 - KLPS SIZE 1 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
425	50	5	(10.0)	6.0	(12.0)
417	49	4.9	(9.8)	5.9	(11.8)
408	48	4.8	(9.6)	5.8	(11.7)
400	47	4.7	(9.4)	5.8	(11.5)
391	46	4.6	(9.2)	5.7	(11.4)
383	45	4.5	(9.0)	5.6	(11.2)
374	44	4.4	(8.8)	5.5	(11.0)
366	43	4.3	(8.6)	5.4	(10.9)
357	42	4.2	(8.4)	5.4	(10.7)
349	41	4.1	(8.2)	5.3	(10.6)
340	40	4	(8.0)	5.2	(10.4)
332	39	3.9	(7.8)	5.1	(10.2)
323	38	3.8	(7.6)	5.0	(10.1)
315	37	3.7	(7.4)	5.0	(9.9)
306	36	3.6	(7.2)	4.9	(9.8)
298	35	3.5	(7.0)	4.8	(9.6)
289	34	3.4	(6.8)	4.7	(9.4)
281	33	3.3	(6.6)	4.6	(9.3)
272	32	3.2	(6.4)	4.6	(9.1)
264	31	3.1	(6.2)	4.5	(9.0)
255	30	3	(6.0)	4.4	(8.8)
247	29	2.9	(5.8)	4.2	(8.6)
238	28	2.8	(5.6)	4.2	(8.5)
230	27	2.7	(5.4)	4.1	(8.3)
221	26	2.6	(5.2)	4.0	(8.2)
213	25	2.5	(5.0)	3.9	(8.0)
204	24	2.4	(4.8)	3.8	(7.8)
196	23	2.3	(4.6)	3.8	(7.7)
187	22	2.2	(4.4)	3.6	(7.5)
179	21	2.1	(4.2)	3.7	(7.4)
170	20	2	(4.0)	3.6	(7.2)
162	19	1.9	(3.8)	3.5	(7.0)
153	18	1.8	(3.6)	3.4	(6.9)
145	17	1.7	(3.4)	3.4	(6.7)
136	16	1.6	(3.2)	3.3	(6.6)
128	15	1.5	(3.0)	3.2	(6.4)
119	14	1.4	(2.8)	3.1	(6.2)
111	13	1.3	(2.6)	3.0	(6.1)
102	12	1.2	(2.4)	3.0	(5.9)
94	11	1.1	(2.2)	2.9	(5.8)
85	10	1	(2.0)	2.8	(5.6)
77	9	0.9	(1.8)	2.7	(5.4)
68	8	0.8	(1.6)	2.6	(5.3)
60	7	0.7	(1.4)	2.6	(5.1)
51	6	0.6	(1.2)	2.5	(5.0)
43	5	0.5	(1.0)	2.4	(4.8)
34	4	0.4	(0.8)	2.3	(4.6)
26	3	0.3	(0.6)	2.2	(4.5)
17	2	0.2	(0.4)	2.2	(4.3)
9	1	0.1	(0.2)	2.1	(4.2)

TABLE 23 - KLPS SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
925	100	10	(20.0)	10	(20.0)
916	99	9.9	(19.8)	9.9	(19.8)
907	98	9.8	(19.6)	9.8	(19.7)
898	97	9.7	(19.4)	9.8	(19.5)
888	96	9.6	(19.2)	9.7	(19.4)
879	95	9.5	(19.0)	9.6	(19.2)
870	94	9.4	(18.8)	9.5	(19.0)
861	93	9.3	(18.6)	9.4	(18.9)
851	92	9.2	(18.4)	9.4	(18.7)
842	91	9.1	(18.2)	9.3	(18.6)
833	90	9.0	(18.0)	9.2	(18.4)
824	89	8.9	(17.8)	9.1	(18.2)
814	88	8.8	(17.6)	9.0	(18.1)
805	87	8.7	(17.4)	9.0	(17.9)
796	86	8.6	(17.2)	8.9	(17.8)
787	85	8.5	(17.0)	8.8	(17.6)
777	84	8.4	(16.8)	8.7	(17.4)
768	83	8.3	(16.6)	8.6	(17.3)
759	82	8.2	(16.4)	8.6	(17.1)
750	81	8.1	(16.2)	8.5	(17.0)
740	80	8.0	(16.0)	8.4	(16.8)
731	79	7.9	(15.8)	8.3	(16.6)
722	78	7.8	(15.6)	8.2	(16.5)
713	77	7.7	(15.4)	8.2	(16.3)
703	76	7.6	(15.2)	8.1	(16.2)
694	75	7.5	(15.0)	8.0	(16.0)
685	74	7.4	(14.8)	7.9	(15.8)
676	73	7.3	(14.6)	7.8	(15.7)
666	72	7.2	(14.2)	7.8	(15.5)
657	71	7.1	(14.0)	7.7	(15.4)
648	70	7.0	(13.8)	7.6	(15.2)
639	69	6.9	(13.6)	7.5	(15.0)
629	68	6.8	(13.6)	7.4	(14.9)
620	67	6.7	(13.4)	7.4	(14.7)
611	66	6.6	(13.2)	7.3	(14.6)
602	65	6.5	(13.0)	7.2	(14.4)
592	64	6.4	(12.8)	7.1	(14.2)
583	63	6.3	(12.6)	7.0	(14.1)
574	62	6.2	(12.4)	7.0	(13.9)
565	61	6.1	(12.2)	6.9	(13.8)
555	60	6.0	(12.0)	6.8	(13.6)
546	59	5.9	(11.8)	6.7	(13.4)
537	58	5.8	(11.6)	6.6	(13.3)
528	57	5.7	(11.4)	6.6	(13.1)
518	56	5.6	(11.2)	6.5	(13.0)
509	55	5.5	(11.0)	6.4	(12.8)
500	54	5.4	(10.8)	6.3	(12.6)
491	53	5.3	(10.6)	6.2	(12.5)
481	52	5.2	(10.4)	6.2	(12.3)
472	51	5.1	(10.2)	6.1	(12.2)

TABLE 23 - KLPS SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
463	50	5	(10.0)	6.0	(12.0)
454	49	4.9	(9.8)	5.9	(11.8)
444	48	4.8	(9.6)	5.8	(11.7)
435	47	4.7	(9.4)	5.8	(11.5)
426	46	4.6	(9.2)	5.7	(11.4)
417	45	4.5	(9.0)	5.6	(11.2)
407	44	4.4	(8.8)	5.5	(11.0)
398	43	4.3	(8.6)	5.4	(10.9)
389	42	4.2	(8.4)	5.4	(10.7)
380	41	4.1	(8.2)	5.3	(10.6)
370	40	4	(8.0)	5.2	(10.4)
361	39	3.9	(7.8)	5.1	(10.2)
352	38	3.8	(7.6)	5.0	(10.1)
343	37	3.7	(7.4)	5.0	(9.9)
333	36	3.6	(7.2)	4.9	(9.8)
324	35	3.5	(7.0)	4.8	(9.6)
315	34	3.4	(6.8)	4.7	(9.4)
306	33	3.3	(6.6)	4.6	(9.3)
296	32	3.2	(6.4)	4.6	(9.1)
287	31	3.1	(6.2)	4.5	(9.0)
278	30	3	(6.0)	4.4	(8.8)
269	29	2.9	(5.8)	4.2	(8.6)
259	28	2.8	(5.6)	4.2	(8.5)
250	27	2.7	(5.4)	4.1	(8.3)
241	26	2.6	(5.2)	4.0	(8.2)
232	25	2.5	(5.0)	3.9	(8.0)
222	24	2.4	(4.8)	3.8	(7.8)
213	23	2.3	(4.6)	3.8	(7.7)
204	22	2.2	(4.4)	3.6	(7.5)
195	21	2.1	(4.2)	3.7	(7.4)
185	20	2	(4.0)	3.6	(7.2)
176	19	1.9	(3.8)	3.5	(7.0)
167	18	1.8	(3.6)	3.4	(6.9)
158	17	1.7	(3.4)	3.4	(6.7)
148	16	1.6	(3.2)	3.3	(6.6)
139	15	1.5	(3.0)	3.2	(6.4)
130	14	1.4	(2.8)	3.1	(6.2)
121	13	1.3	(2.6)	3.0	(6.1)
111	12	1.2	(2.4)	3.0	(5.9)
102	11	1.1	(2.2)	2.9	(5.8)
93	10	1	(2.0)	2.8	(5.6)
84	9	0.9	(1.8)	2.7	(5.4)
74	8	0.8	(1.6)	2.6	(5.3)
65	7	0.7	(1.4)	2.6	(5.1)
56	6	0.6	(1.2)	2.5	(5.0)
47	5	0.5	(1.0)	2.4	(4.8)
37	4	0.4	(0.8)	2.3	(4.6)
28	3	0.3	(0.6)	2.2	(4.5)
19	2	0.2	(0.4)	2.2	(4.3)
10	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 24 - KLPS SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1125	100	10	(20.0)	10	(20.0)
1114	99	9.9	(19.8)	9.9	(19.8)
1103	98	9.8	(19.6)	9.8	(19.7)
1092	97	9.7	(19.4)	9.8	(19.5)
1080	96	9.6	(19.2)	9.7	(19.4)
1069	95	9.5	(19.0)	9.6	(19.2)
1058	94	9.4	(18.8)	9.5	(19.0)
1047	93	9.3	(18.6)	9.4	(18.9)
1035	92	9.2	(18.4)	9.4	(18.7)
1024	91	9.1	(18.2)	9.3	(18.6)
1013	90	9.0	(18.0)	9.2	(18.4)
1002	89	8.9	(17.8)	9.1	(18.2)
990	88	8.8	(17.6)	9.0	(18.1)
979	87	8.7	(17.4)	9.0	(17.9)
968	86	8.6	(17.2)	8.9	(17.8)
957	85	8.5	(17.0)	8.8	(17.6)
945	84	8.4	(16.8)	8.7	(17.4)
934	83	8.3	(16.6)	8.6	(17.3)
923	82	8.2	(16.4)	8.6	(17.1)
912	81	8.1	(16.2)	8.5	(17.0)
900	80	8.0	(16.0)	8.4	(16.8)
889	79	7.9	(15.8)	8.3	(16.6)
878	78	7.8	(15.6)	8.2	(16.5)
867	77	7.7	(15.4)	8.2	(16.3)
855	76	7.6	(15.2)	8.1	(16.2)
844	75	7.5	(15.0)	8.0	(16.0)
833	74	7.4	(14.8)	7.9	(15.8)
822	73	7.3	(14.6)	7.8	(15.7)
810	72	7.2	(14.2)	7.8	(15.5)
799	71	7.1	(14.0)	7.7	(15.4)
788	70	7.0	(13.8)	7.6	(15.2)
777	69	6.9	(13.6)	7.5	(15.0)
765	68	6.8	(13.6)	7.4	(14.9)
754	67	6.7	(13.4)	7.4	(14.7)
743	66	6.6	(13.2)	7.3	(14.6)
732	65	6.5	(13.0)	7.2	(14.4)
720	64	6.4	(12.8)	7.1	(14.2)
709	63	6.3	(12.6)	7.0	(14.1)
698	62	6.2	(12.4)	7.0	(13.9)
687	61	6.1	(12.2)	6.9	(13.8)
675	60	6.0	(12.0)	6.8	(13.6)
664	59	5.9	(11.8)	6.7	(13.4)
653	58	5.8	(11.6)	6.6	(13.3)
642	57	5.7	(11.4)	6.6	(13.1)
630	56	5.6	(11.2)	6.5	(13.0)
619	55	5.5	(11.0)	6.4	(12.8)
608	54	5.4	(10.8)	6.3	(12.6)
597	53	5.3	(10.6)	6.2	(12.5)
585	52	5.2	(10.4)	6.2	(12.3)
574	51	5.1	(10.2)	6.1	(12.2)

TABLE 24 - KLPS SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
563	50	5	(10.0)	6.0	(12.0)
552	49	4.9	(9.8)	5.9	(11.8)
540	48	4.8	(9.6)	5.8	(11.7)
529	47	4.7	(9.4)	5.8	(11.5)
518	46	4.6	(9.2)	5.7	(11.4)
507	45	4.5	(9.0)	5.6	(11.2)
495	44	4.4	(8.8)	5.5	(11.0)
484	43	4.3	(8.6)	5.4	(10.9)
473	42	4.2	(8.4)	5.4	(10.7)
462	41	4.1	(8.2)	5.3	(10.6)
450	40	4	(8.0)	5.2	(10.4)
439	39	3.9	(7.8)	5.1	(10.2)
428	38	3.8	(7.6)	5.0	(10.1)
417	37	3.7	(7.4)	5.0	(9.9)
405	36	3.6	(7.2)	4.9	(9.8)
394	35	3.5	(7.0)	4.8	(9.6)
383	34	3.4	(6.8)	4.7	(9.4)
372	33	3.3	(6.6)	4.6	(9.3)
360	32	3.2	(6.4)	4.6	(9.1)
349	31	3.1	(6.2)	4.5	(9.0)
338	30	3	(6.0)	4.4	(8.8)
327	29	2.9	(5.8)	4.2	(8.6)
315	28	2.8	(5.6)	4.2	(8.5)
304	27	2.7	(5.4)	4.1	(8.3)
293	26	2.6	(5.2)	4.0	(8.2)
282	25	2.5	(5.0)	3.9	(8.0)
270	24	2.4	(4.8)	3.8	(7.8)
259	23	2.3	(4.6)	3.8	(7.7)
248	22	2.2	(4.4)	3.6	(7.5)
237	21	2.1	(4.2)	3.7	(7.4)
225	20	2	(4.0)	3.6	(7.2)
214	19	1.9	(3.8)	3.5	(7.0)
203	18	1.8	(3.6)	3.4	(6.9)
192	17	1.7	(3.4)	3.4	(6.7)
180	16	1.6	(3.2)	3.3	(6.6)
169	15	1.5	(3.0)	3.2	(6.4)
158	14	1.4	(2.8)	3.1	(6.2)
147	13	1.3	(2.6)	3.0	(6.1)
135	12	1.2	(2.4)	3.0	(5.9)
124	11	1.1	(2.2)	2.9	(5.8)
113	10	1	(2.0)	2.8	(5.6)
102	9	0.9	(1.8)	2.7	(5.4)
90	8	0.8	(1.6)	2.6	(5.3)
79	7	0.7	(1.4)	2.6	(5.1)
68	6	0.6	(1.2)	2.5	(5.0)
57	5	0.5	(1.0)	2.4	(4.8)
45	4	0.4	(0.8)	2.3	(4.6)
34	3	0.3	(0.6)	2.2	(4.5)
23	2	0.2	(0.4)	2.2	(4.3)
12	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 25 - KLPS SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1900	100	10	(20.0)	10	(20.0)
1881	99	9.9	(19.8)	9.9	(19.8)
1862	98	9.8	(19.6)	9.8	(19.7)
1843	97	9.7	(19.4)	9.8	(19.5)
1824	96	9.6	(19.2)	9.7	(19.4)
1805	95	9.5	(19.0)	9.6	(19.2)
1786	94	9.4	(18.8)	9.5	(19.0)
1767	93	9.3	(18.6)	9.4	(18.9)
1748	92	9.2	(18.4)	9.4	(18.7)
1729	91	9.1	(18.2)	9.3	(18.6)
1710	90	9.0	(18.0)	9.2	(18.4)
1691	89	8.9	(17.8)	9.1	(18.2)
1672	88	8.8	(17.6)	9.0	(18.1)
1653	87	8.7	(17.4)	9.0	(17.9)
1634	86	8.6	(17.2)	8.9	(17.8)
1615	85	8.5	(17.0)	8.8	(17.6)
1596	84	8.4	(16.8)	8.7	(17.4)
1577	83	8.3	(16.6)	8.6	(17.3)
1558	82	8.2	(16.4)	8.6	(17.1)
1539	81	8.1	(16.2)	8.5	(17.0)
1520	80	8.0	(16.0)	8.4	(16.8)
1501	79	7.9	(15.8)	8.3	(16.6)
1482	78	7.8	(15.6)	8.2	(16.5)
1463	77	7.7	(15.4)	8.2	(16.3)
1444	76	7.6	(15.2)	8.1	(16.2)
1425	75	7.5	(15.0)	8.0	(16.0)
1406	74	7.4	(14.8)	7.9	(15.8)
1387	73	7.3	(14.6)	7.8	(15.7)
1368	72	7.2	(14.2)	7.8	(15.5)
1349	71	7.1	(14.0)	7.7	(15.4)
1330	70	7.0	(13.8)	7.6	(15.2)
1311	69	6.9	(13.6)	7.5	(15.0)
1292	68	6.8	(13.6)	7.4	(14.9)
1273	67	6.7	(13.4)	7.4	(14.7)
1254	66	6.6	(13.2)	7.3	(14.6)
1235	65	6.5	(13.0)	7.2	(14.4)
1216	64	6.4	(12.8)	7.1	(14.2)
1197	63	6.3	(12.6)	7.0	(14.1)
1178	62	6.2	(12.4)	7.0	(13.9)
1159	61	6.1	(12.2)	6.9	(13.8)
1140	60	6.0	(12.0)	6.8	(13.6)
1121	59	5.9	(11.8)	6.7	(13.4)
1102	58	5.8	(11.6)	6.6	(13.3)
1083	57	5.7	(11.4)	6.6	(13.1)
1064	56	5.6	(11.2)	6.5	(13.0)
1045	55	5.5	(11.0)	6.4	(12.8)
1026	54	5.4	(10.8)	6.3	(12.6)
1007	53	5.3	(10.6)	6.2	(12.5)
988	52	5.2	(10.4)	6.2	(12.3)
969	51	5.1	(10.2)	6.1	(12.2)

TABLE 25 - KLPS SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
950	50	5	(10.0)	6.0	(12.0)
931	49	4.9	(9.8)	5.9	(11.8)
912	48	4.8	(9.6)	5.8	(11.7)
893	47	4.7	(9.4)	5.8	(11.5)
874	46	4.6	(9.2)	5.7	(11.4)
855	45	4.5	(9.0)	5.6	(11.2)
836	44	4.4	(8.8)	5.5	(11.0)
817	43	4.3	(8.6)	5.4	(10.9)
798	42	4.2	(8.4)	5.4	(10.7)
779	41	4.1	(8.2)	5.3	(10.6)
760	40	4	(8.0)	5.2	(10.4)
741	39	3.9	(7.8)	5.1	(10.2)
722	38	3.8	(7.6)	5.0	(10.1)
703	37	3.7	(7.4)	5.0	(9.9)
684	36	3.6	(7.2)	4.9	(9.8)
665	35	3.5	(7.0)	4.8	(9.6)
646	34	3.4	(6.8)	4.7	(9.4)
627	33	3.3	(6.6)	4.6	(9.3)
608	32	3.2	(6.4)	4.6	(9.1)
589	31	3.1	(6.2)	4.5	(9.0)
570	30	3	(6.0)	4.4	(8.8)
551	29	2.9	(5.8)	4.2	(8.6)
532	28	2.8	(5.6)	4.2	(8.5)
513	27	2.7	(5.4)	4.1	(8.3)
494	26	2.6	(5.2)	4.0	(8.2)
475	25	2.5	(5.0)	3.9	(8.0)
456	24	2.4	(4.8)	3.8	(7.8)
437	23	2.3	(4.6)	3.8	(7.7)
418	22	2.2	(4.4)	3.6	(7.5)
399	21	2.1	(4.2)	3.7	(7.4)
380	20	2	(4.0)	3.6	(7.2)
361	19	1.9	(3.8)	3.5	(7.0)
342	18	1.8	(3.6)	3.4	(6.9)
323	17	1.7	(3.4)	3.4	(6.7)
304	16	1.6	(3.2)	3.3	(6.6)
285	15	1.5	(3.0)	3.2	(6.4)
266	14	1.4	(2.8)	3.1	(6.2)
247	13	1.3	(2.6)	3.0	(6.1)
228	12	1.2	(2.4)	3.0	(5.9)
209	11	1.1	(2.2)	2.9	(5.8)
190	10	1	(2.0)	2.8	(5.6)
171	9	0.9	(1.8)	2.7	(5.4)
152	8	0.8	(1.6)	2.6	(5.3)
133	7	0.7	(1.4)	2.6	(5.1)
114	6	0.6	(1.2)	2.5	(5.0)
95	5	0.5	(1.0)	2.4	(4.8)
76	4	0.4	(0.8)	2.3	(4.6)
57	3	0.3	(0.6)	2.2	(4.5)
38	2	0.2	(0.4)	2.2	(4.3)
19	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 26 - KLPS SIZE 5 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1790	100	10	(20.0)	10	(20.0)
1773	99	9.9	(19.8)	9.9	(19.8)
1755	98	9.8	(19.6)	9.8	(19.7)
1737	97	9.7	(19.4)	9.8	(19.5)
1719	96	9.6	(19.2)	9.7	(19.4)
1701	95	9.5	(19.0)	9.6	(19.2)
1683	94	9.4	(18.8)	9.5	(19.0)
1665	93	9.3	(18.6)	9.4	(18.9)
1647	92	9.2	(18.4)	9.4	(18.7)
1629	91	9.1	(18.2)	9.3	(18.6)
1611	90	9.0	(18.0)	9.2	(18.4)
1594	89	8.9	(17.8)	9.1	(18.2)
1576	88	8.8	(17.6)	9.0	(18.1)
1558	87	8.7	(17.4)	9.0	(17.9)
1540	86	8.6	(17.2)	8.9	(17.8)
1522	85	8.5	(17.0)	8.8	(17.6)
1504	84	8.4	(16.8)	8.7	(17.4)
1486	83	8.3	(16.6)	8.6	(17.3)
1468	82	8.2	(16.4)	8.6	(17.1)
1450	81	8.1	(16.2)	8.5	(17.0)
1432	80	8.0	(16.0)	8.4	(16.8)
1415	79	7.9	(15.8)	8.3	(16.6)
1397	78	7.8	(15.6)	8.2	(16.5)
1379	77	7.7	(15.4)	8.2	(16.3)
1361	76	7.6	(15.2)	8.1	(16.2)
1343	75	7.5	(15.0)	8.0	(16.0)
1325	74	7.4	(14.8)	7.9	(15.8)
1307	73	7.3	(14.6)	7.8	(15.7)
1289	72	7.2	(14.2)	7.8	(15.5)
1271	71	7.1	(14.0)	7.7	(15.4)
1253	70	7.0	(13.8)	7.6	(15.2)
1236	69	6.9	(13.6)	7.5	(15.0)
1218	68	6.8	(13.6)	7.4	(14.9)
1200	67	6.7	(13.4)	7.4	(14.7)
1182	66	6.6	(13.2)	7.3	(14.6)
1164	65	6.5	(13.0)	7.2	(14.4)
1146	64	6.4	(12.8)	7.1	(14.2)
1128	63	6.3	(12.6)	7.0	(14.1)
1110	62	6.2	(12.4)	7.0	(13.9)
1092	61	6.1	(12.2)	6.9	(13.8)
1074	60	6.0	(12.0)	6.8	(13.6)
1057	59	5.9	(11.8)	6.7	(13.4)
1039	58	5.8	(11.6)	6.6	(13.3)
1021	57	5.7	(11.4)	6.6	(13.1)
1003	56	5.6	(11.2)	6.5	(13.0)
985	55	5.5	(11.0)	6.4	(12.8)
967	54	5.4	(10.8)	6.3	(12.6)
949	53	5.3	(10.6)	6.2	(12.5)
931	52	5.2	(10.4)	6.2	(12.3)
913	51	5.1	(10.2)	6.1	(12.2)

TABLE 26 - KLPS SIZE 5 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
895	50	5	(10.0)	6.0	(12.0)
878	49	4.9	(9.8)	5.9	(11.8)
860	48	4.8	(9.6)	5.8	(11.7)
842	47	4.7	(9.4)	5.8	(11.5)
824	46	4.6	(9.2)	5.7	(11.4)
806	45	4.5	(9.0)	5.6	(11.2)
788	44	4.4	(8.8)	5.5	(11.0)
770	43	4.3	(8.6)	5.4	(10.9)
752	42	4.2	(8.4)	5.4	(10.7)
734	41	4.1	(8.2)	5.3	(10.6)
716	40	4	(8.0)	5.2	(10.4)
699	39	3.9	(7.8)	5.1	(10.2)
681	38	3.8	(7.6)	5.0	(10.1)
663	37	3.7	(7.4)	5.0	(9.9)
645	36	3.6	(7.2)	4.9	(9.8)
627	35	3.5	(7.0)	4.8	(9.6)
609	34	3.4	(6.8)	4.7	(9.4)
591	33	3.3	(6.6)	4.6	(9.3)
573	32	3.2	(6.4)	4.6	(9.1)
555	31	3.1	(6.2)	4.5	(9.0)
537	30	3	(6.0)	4.4	(8.8)
520	29	2.9	(5.8)	4.2	(8.6)
502	28	2.8	(5.6)	4.2	(8.5)
484	27	2.7	(5.4)	4.1	(8.3)
466	26	2.6	(5.2)	4.0	(8.2)
448	25	2.5	(5.0)	3.9	(8.0)
430	24	2.4	(4.8)	3.8	(7.8)
412	23	2.3	(4.6)	3.8	(7.7)
394	22	2.2	(4.4)	3.6	(7.5)
376	21	2.1	(4.2)	3.7	(7.4)
358	20	2	(4.0)	3.6	(7.2)
341	19	1.9	(3.8)	3.5	(7.0)
323	18	1.8	(3.6)	3.4	(6.9)
305	17	1.7	(3.4)	3.4	(6.7)
287	16	1.6	(3.2)	3.3	(6.6)
269	15	1.5	(3.0)	3.2	(6.4)
251	14	1.4	(2.8)	3.1	(6.2)
233	13	1.3	(2.6)	3.0	(6.1)
215	12	1.2	(2.4)	3.0	(5.9)
197	11	1.1	(2.2)	2.9	(5.8)
179	10	1	(2.0)	2.8	(5.6)
162	9	0.9	(1.8)	2.7	(5.4)
144	8	0.8	(1.6)	2.6	(5.3)
126	7	0.7	(1.4)	2.6	(5.1)
108	6	0.6	(1.2)	2.5	(5.0)
90	5	0.5	(1.0)	2.4	(4.8)
72	4	0.4	(0.8)	2.3	(4.6)
54	3	0.3	(0.6)	2.2	(4.5)
36	2	0.2	(0.4)	2.2	(4.3)
18	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 27 - KLPS-D SIZE 1 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
775	100	10	(20.0)	10	(20.0)
768	99	9.9	(19.8)	9.9	(19.8)
760	98	9.8	(19.6)	9.8	(19.7)
752	97	9.7	(19.4)	9.8	(19.5)
744	96	9.6	(19.2)	9.7	(19.4)
737	95	9.5	(19.0)	9.6	(19.2)
729	94	9.4	(18.8)	9.5	(19.0)
721	93	9.3	(18.6)	9.4	(18.9)
713	92	9.2	(18.4)	9.4	(18.7)
706	91	9.1	(18.2)	9.3	(18.6)
698	90	9.0	(18.0)	9.2	(18.4)
690	89	8.9	(17.8)	9.1	(18.2)
682	88	8.8	(17.6)	9.0	(18.1)
675	87	8.7	(17.4)	9.0	(17.9)
667	86	8.6	(17.2)	8.9	(17.8)
659	85	8.5	(17.0)	8.8	(17.6)
651	84	8.4	(16.8)	8.7	(17.4)
644	83	8.3	(16.6)	8.6	(17.3)
636	82	8.2	(16.4)	8.6	(17.1)
628	81	8.1	(16.2)	8.5	(17.0)
620	80	8.0	(16.0)	8.4	(16.8)
613	79	7.9	(15.8)	8.3	(16.6)
605	78	7.8	(15.6)	8.2	(16.5)
597	77	7.7	(15.4)	8.2	(16.3)
589	76	7.6	(15.2)	8.1	(16.2)
582	75	7.5	(15.0)	8.0	(16.0)
574	74	7.4	(14.8)	7.9	(15.8)
566	73	7.3	(14.6)	7.8	(15.7)
558	72	7.2	(14.2)	7.8	(15.5)
551	71	7.1	(14.0)	7.7	(15.4)
543	70	7.0	(13.8)	7.6	(15.2)
535	69	6.9	(13.6)	7.5	(15.0)
527	68	6.8	(13.6)	7.4	(14.9)
520	67	6.7	(13.4)	7.4	(14.7)
512	66	6.6	(13.2)	7.3	(14.6)
504	65	6.5	(13.0)	7.2	(14.4)
496	64	6.4	(12.8)	7.1	(14.2)
489	63	6.3	(12.6)	7.0	(14.1)
481	62	6.2	(12.4)	7.0	(13.9)
473	61	6.1	(12.2)	6.9	(13.8)
465	60	6.0	(12.0)	6.8	(13.6)
458	59	5.9	(11.8)	6.7	(13.4)
450	58	5.8	(11.6)	6.6	(13.3)
442	57	5.7	(11.4)	6.6	(13.1)
434	56	5.6	(11.2)	6.5	(13.0)
427	55	5.5	(11.0)	6.4	(12.8)
419	54	5.4	(10.8)	6.3	(12.6)
411	53	5.3	(10.6)	6.2	(12.5)
403	52	5.2	(10.4)	6.2	(12.3)
396	51	5.1	(10.2)	6.1	(12.2)

TABLE 27 - KLPS-D SIZE 1 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
388	50	5	(10.0)	6.0	(12.0)
380	49	4.9	(9.8)	5.9	(11.8)
372	48	4.8	(9.6)	5.8	(11.7)
365	47	4.7	(9.4)	5.8	(11.5)
357	46	4.6	(9.2)	5.7	(11.4)
349	45	4.5	(9.0)	5.6	(11.2)
341	44	4.4	(8.8)	5.5	(11.0)
334	43	4.3	(8.6)	5.4	(10.9)
326	42	4.2	(8.4)	5.4	(10.7)
318	41	4.1	(8.2)	5.3	(10.6)
310	40	4	(8.0)	5.2	(10.4)
303	39	3.9	(7.8)	5.1	(10.2)
295	38	3.8	(7.6)	5.0	(10.1)
287	37	3.7	(7.4)	5.0	(9.9)
279	36	3.6	(7.2)	4.9	(9.8)
272	35	3.5	(7.0)	4.8	(9.6)
264	34	3.4	(6.8)	4.7	(9.4)
256	33	3.3	(6.6)	4.6	(9.3)
248	32	3.2	(6.4)	4.6	(9.1)
241	31	3.1	(6.2)	4.5	(9.0)
233	30	3	(6.0)	4.4	(8.8)
225	29	2.9	(5.8)	4.2	(8.6)
217	28	2.8	(5.6)	4.2	(8.5)
210	27	2.7	(5.4)	4.1	(8.3)
202	26	2.6	(5.2)	4.0	(8.2)
194	25	2.5	(5.0)	3.9	(8.0)
186	24	2.4	(4.8)	3.8	(7.8)
179	23	2.3	(4.6)	3.8	(7.7)
171	22	2.2	(4.4)	3.6	(7.5)
163	21	2.1	(4.2)	3.7	(7.4)
155	20	2	(4.0)	3.6	(7.2)
148	19	1.9	(3.8)	3.5	(7.0)
140	18	1.8	(3.6)	3.4	(6.9)
132	17	1.7	(3.4)	3.4	(6.7)
124	16	1.6	(3.2)	3.3	(6.6)
117	15	1.5	(3.0)	3.2	(6.4)
109	14	1.4	(2.8)	3.1	(6.2)
101	13	1.3	(2.6)	3.0	(6.1)
93	12	1.2	(2.4)	3.0	(5.9)
86	11	1.1	(2.2)	2.9	(5.8)
78	10	1	(2.0)	2.8	(5.6)
70	9	0.9	(1.8)	2.7	(5.4)
62	8	0.8	(1.6)	2.6	(5.3)
55	7	0.7	(1.4)	2.6	(5.1)
47	6	0.6	(1.2)	2.5	(5.0)
39	5	0.5	(1.0)	2.4	(4.8)
31	4	0.4	(0.8)	2.3	(4.6)
24	3	0.3	(0.6)	2.2	(4.5)
16	2	0.2	(0.4)	2.2	(4.3)
8	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 28 - KLPS-D SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
875	100	10	(20.0)	10	(20.0)
867	99	9.9	(19.8)	9.9	(19.8)
858	98	9.8	(19.6)	9.8	(19.7)
849	97	9.7	(19.4)	9.8	(19.5)
840	96	9.6	(19.2)	9.7	(19.4)
832	95	9.5	(19.0)	9.6	(19.2)
823	94	9.4	(18.8)	9.5	(19.0)
814	93	9.3	(18.6)	9.4	(18.9)
805	92	9.2	(18.4)	9.4	(18.7)
797	91	9.1	(18.2)	9.3	(18.6)
788	90	9.0	(18.0)	9.2	(18.4)
779	89	8.9	(17.8)	9.1	(18.2)
770	88	8.8	(17.6)	9.0	(18.1)
762	87	8.7	(17.4)	9.0	(17.9)
753	86	8.6	(17.2)	8.9	(17.8)
744	85	8.5	(17.0)	8.8	(17.6)
735	84	8.4	(16.8)	8.7	(17.4)
727	83	8.3	(16.6)	8.6	(17.3)
718	82	8.2	(16.4)	8.6	(17.1)
709	81	8.1	(16.2)	8.5	(17.0)
700	80	8.0	(16.0)	8.4	(16.8)
692	79	7.9	(15.8)	8.3	(16.6)
683	78	7.8	(15.6)	8.2	(16.5)
674	77	7.7	(15.4)	8.2	(16.3)
665	76	7.6	(15.2)	8.1	(16.2)
657	75	7.5	(15.0)	8.0	(16.0)
648	74	7.4	(14.8)	7.9	(15.8)
639	73	7.3	(14.6)	7.8	(15.7)
630	72	7.2	(14.2)	7.8	(15.5)
622	71	7.1	(14.0)	7.7	(15.4)
613	70	7.0	(13.8)	7.6	(15.2)
604	69	6.9	(13.6)	7.5	(15.0)
595	68	6.8	(13.6)	7.4	(14.9)
587	67	6.7	(13.4)	7.4	(14.7)
578	66	6.6	(13.2)	7.3	(14.6)
569	65	6.5	(13.0)	7.2	(14.4)
560	64	6.4	(12.8)	7.1	(14.2)
552	63	6.3	(12.6)	7.0	(14.1)
543	62	6.2	(12.4)	7.0	(13.9)
534	61	6.1	(12.2)	6.9	(13.8)
525	60	6.0	(12.0)	6.8	(13.6)
517	59	5.9	(11.8)	6.7	(13.4)
508	58	5.8	(11.6)	6.6	(13.3)
499	57	5.7	(11.4)	6.6	(13.1)
490	56	5.6	(11.2)	6.5	(13.0)
482	55	5.5	(11.0)	6.4	(12.8)
473	54	5.4	(10.8)	6.3	(12.6)
464	53	5.3	(10.6)	6.2	(12.5)
455	52	5.2	(10.4)	6.2	(12.3)
447	51	5.1	(10.2)	6.1	(12.2)

TABLE 28 - KLPS-D SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
438	50	5	(10.0)	6.0	(12.0)
429	49	4.9	(9.8)	5.9	(11.8)
420	48	4.8	(9.6)	5.8	(11.7)
412	47	4.7	(9.4)	5.8	(11.5)
403	46	4.6	(9.2)	5.7	(11.4)
394	45	4.5	(9.0)	5.6	(11.2)
385	44	4.4	(8.8)	5.5	(11.0)
377	43	4.3	(8.6)	5.4	(10.9)
368	42	4.2	(8.4)	5.4	(10.7)
359	41	4.1	(8.2)	5.3	(10.6)
350	40	4	(8.0)	5.2	(10.4)
342	39	3.9	(7.8)	5.1	(10.2)
333	38	3.8	(7.6)	5.0	(10.1)
324	37	3.7	(7.4)	5.0	(9.9)
315	36	3.6	(7.2)	4.9	(9.8)
307	35	3.5	(7.0)	4.8	(9.6)
298	34	3.4	(6.8)	4.7	(9.4)
289	33	3.3	(6.6)	4.6	(9.3)
280	32	3.2	(6.4)	4.6	(9.1)
272	31	3.1	(6.2)	4.5	(9.0)
263	30	3	(6.0)	4.4	(8.8)
254	29	2.9	(5.8)	4.2	(8.6)
245	28	2.8	(5.6)	4.2	(8.5)
237	27	2.7	(5.4)	4.1	(8.3)
228	26	2.6	(5.2)	4.0	(8.2)
219	25	2.5	(5.0)	3.9	(8.0)
210	24	2.4	(4.8)	3.8	(7.8)
202	23	2.3	(4.6)	3.8	(7.7)
193	22	2.2	(4.4)	3.6	(7.5)
184	21	2.1	(4.2)	3.7	(7.4)
175	20	2	(4.0)	3.6	(7.2)
167	19	1.9	(3.8)	3.5	(7.0)
158	18	1.8	(3.6)	3.4	(6.9)
149	17	1.7	(3.4)	3.4	(6.7)
140	16	1.6	(3.2)	3.3	(6.6)
132	15	1.5	(3.0)	3.2	(6.4)
123	14	1.4	(2.8)	3.1	(6.2)
114	13	1.3	(2.6)	3.0	(6.1)
105	12	1.2	(2.4)	3.0	(5.9)
97	11	1.1	(2.2)	2.9	(5.8)
88	10	1	(2.0)	2.8	(5.6)
79	9	0.9	(1.8)	2.7	(5.4)
70	8	0.8	(1.6)	2.6	(5.3)
62	7	0.7	(1.4)	2.6	(5.1)
53	6	0.6	(1.2)	2.5	(5.0)
44	5	0.5	(1.0)	2.4	(4.8)
35	4	0.4	(0.8)	2.3	(4.6)
27	3	0.3	(0.6)	2.2	(4.5)
18	2	0.2	(0.4)	2.2	(4.3)
9	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 29 - KLPS-D SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1000	100	10	(20.0)	10	(20.0)
990	99	9.9	(19.8)	9.9	(19.8)
980	98	9.8	(19.6)	9.8	(19.7)
970	97	9.7	(19.4)	9.8	(19.5)
960	96	9.6	(19.2)	9.7	(19.4)
950	95	9.5	(19.0)	9.6	(19.2)
940	94	9.4	(18.8)	9.5	(19.0)
930	93	9.3	(18.6)	9.4	(18.9)
920	92	9.2	(18.4)	9.4	(18.7)
910	91	9.1	(18.2)	9.3	(18.6)
900	90	9.0	(18.0)	9.2	(18.4)
890	89	8.9	(17.8)	9.1	(18.2)
880	88	8.8	(17.6)	9.0	(18.1)
870	87	8.7	(17.4)	9.0	(17.9)
860	86	8.6	(17.2)	8.9	(17.8)
850	85	8.5	(17.0)	8.8	(17.6)
840	84	8.4	(16.8)	8.7	(17.4)
830	83	8.3	(16.6)	8.6	(17.3)
820	82	8.2	(16.4)	8.6	(17.1)
810	81	8.1	(16.2)	8.5	(17.0)
800	80	8.0	(16.0)	8.4	(16.8)
790	79	7.9	(15.8)	8.3	(16.6)
780	78	7.8	(15.6)	8.2	(16.5)
770	77	7.7	(15.4)	8.2	(16.3)
760	76	7.6	(15.2)	8.1	(16.2)
750	75	7.5	(15.0)	8.0	(16.0)
740	74	7.4	(14.8)	7.9	(15.8)
730	73	7.3	(14.6)	7.8	(15.7)
720	72	7.2	(14.2)	7.8	(15.5)
710	71	7.1	(14.0)	7.7	(15.4)
700	70	7.0	(13.8)	7.6	(15.2)
690	69	6.9	(13.6)	7.5	(15.0)
680	68	6.8	(13.6)	7.4	(14.9)
670	67	6.7	(13.4)	7.4	(14.7)
660	66	6.6	(13.2)	7.3	(14.6)
650	65	6.5	(13.0)	7.2	(14.4)
640	64	6.4	(12.8)	7.1	(14.2)
630	63	6.3	(12.6)	7.0	(14.1)
620	62	6.2	(12.4)	7.0	(13.9)
610	61	6.1	(12.2)	6.9	(13.8)
600	60	6.0	(12.0)	6.8	(13.6)
590	59	5.9	(11.8)	6.7	(13.4)
580	58	5.8	(11.6)	6.6	(13.3)
570	57	5.7	(11.4)	6.6	(13.1)
560	56	5.6	(11.2)	6.5	(13.0)
550	55	5.5	(11.0)	6.4	(12.8)
540	54	5.4	(10.8)	6.3	(12.6)
530	53	5.3	(10.6)	6.2	(12.5)
520	52	5.2	(10.4)	6.2	(12.3)
510	51	5.1	(10.2)	6.1	(12.2)

TABLE 29 - KLPS-D SIZE 3 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
500	50	5	(10.0)	6.0	(12.0)
490	49	4.9	(9.8)	5.9	(11.8)
480	48	4.8	(9.6)	5.8	(11.7)
470	47	4.7	(9.4)	5.8	(11.5)
460	46	4.6	(9.2)	5.7	(11.4)
450	45	4.5	(9.0)	5.6	(11.2)
440	44	4.4	(8.8)	5.5	(11.0)
430	43	4.3	(8.6)	5.4	(10.9)
420	42	4.2	(8.4)	5.4	(10.7)
410	41	4.1	(8.2)	5.3	(10.6)
400	40	4	(8.0)	5.2	(10.4)
390	39	3.9	(7.8)	5.1	(10.2)
380	38	3.8	(7.6)	5.0	(10.1)
370	37	3.7	(7.4)	5.0	(9.9)
360	36	3.6	(7.2)	4.9	(9.8)
350	35	3.5	(7.0)	4.8	(9.6)
340	34	3.4	(6.8)	4.7	(9.4)
330	33	3.3	(6.6)	4.6	(9.3)
320	32	3.2	(6.4)	4.6	(9.1)
310	31	3.1	(6.2)	4.5	(9.0)
300	30	3	(6.0)	4.4	(8.8)
290	29	2.9	(5.8)	4.2	(8.6)
280	28	2.8	(5.6)	4.2	(8.5)
270	27	2.7	(5.4)	4.1	(8.3)
260	26	2.6	(5.2)	4.0	(8.2)
250	25	2.5	(5.0)	3.9	(8.0)
240	24	2.4	(4.8)	3.8	(7.8)
230	23	2.3	(4.6)	3.8	(7.7)
220	22	2.2	(4.4)	3.6	(7.5)
210	21	2.1	(4.2)	3.7	(7.4)
200	20	2	(4.0)	3.6	(7.2)
190	19	1.9	(3.8)	3.5	(7.0)
180	18	1.8	(3.6)	3.4	(6.9)
170	17	1.7	(3.4)	3.4	(6.7)
160	16	1.6	(3.2)	3.3	(6.6)
150	15	1.5	(3.0)	3.2	(6.4)
140	14	1.4	(2.8)	3.1	(6.2)
130	13	1.3	(2.6)	3.0	(6.1)
120	12	1.2	(2.4)	3.0	(5.9)
110	11	1.1	(2.2)	2.9	(5.8)
100	10	1	(2.0)	2.8	(5.6)
90	9	0.9	(1.8)	2.7	(5.4)
80	8	0.8	(1.6)	2.6	(5.3)
70	7	0.7	(1.4)	2.6	(5.1)
60	6	0.6	(1.2)	2.5	(5.0)
50	5	0.5	(1.0)	2.4	(4.8)
40	4	0.4	(0.8)	2.3	(4.6)
30	3	0.3	(0.6)	2.2	(4.5)
20	2	0.2	(0.4)	2.2	(4.3)
10	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 30 - KLPS-D SIZE 5 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
1625	100	10	(20.0)	10	(20.0)
1609	99	9.9	(19.8)	9.9	(19.8)
1593	98	9.8	(19.6)	9.8	(19.7)
1577	97	9.7	(19.4)	9.8	(19.5)
1560	96	9.6	(19.2)	9.7	(19.4)
1544	95	9.5	(19.0)	9.6	(19.2)
1528	94	9.4	(18.8)	9.5	(19.0)
1512	93	9.3	(18.6)	9.4	(18.9)
1495	92	9.2	(18.4)	9.4	(18.7)
1479	91	9.1	(18.2)	9.3	(18.6)
1463	90	9.0	(18.0)	9.2	(18.4)
1447	89	8.9	(17.8)	9.1	(18.2)
1430	88	8.8	(17.6)	9.0	(18.1)
1414	87	8.7	(17.4)	9.0	(17.9)
1398	86	8.6	(17.2)	8.9	(17.8)
1382	85	8.5	(17.0)	8.8	(17.6)
1365	84	8.4	(16.8)	8.7	(17.4)
1349	83	8.3	(16.6)	8.6	(17.3)
1333	82	8.2	(16.4)	8.6	(17.1)
1317	81	8.1	(16.2)	8.5	(17.0)
1300	80	8.0	(16.0)	8.4	(16.8)
1284	79	7.9	(15.8)	8.3	(16.6)
1268	78	7.8	(15.6)	8.2	(16.5)
1252	77	7.7	(15.4)	8.2	(16.3)
1235	76	7.6	(15.2)	8.1	(16.2)
1219	75	7.5	(15.0)	8.0	(16.0)
1203	74	7.4	(14.8)	7.9	(15.8)
1187	73	7.3	(14.6)	7.8	(15.7)
1170	72	7.2	(14.2)	7.8	(15.5)
1154	71	7.1	(14.0)	7.7	(15.4)
1138	70	7.0	(13.8)	7.6	(15.2)
1122	69	6.9	(13.6)	7.5	(15.0)
1105	68	6.8	(13.6)	7.4	(14.9)
1089	67	6.7	(13.4)	7.4	(14.7)
1073	66	6.6	(13.2)	7.3	(14.6)
1057	65	6.5	(13.0)	7.2	(14.4)
1040	64	6.4	(12.8)	7.1	(14.2)
1024	63	6.3	(12.6)	7.0	(14.1)
1008	62	6.2	(12.4)	7.0	(13.9)
992	61	6.1	(12.2)	6.9	(13.8)
975	60	6.0	(12.0)	6.8	(13.6)
959	59	5.9	(11.8)	6.7	(13.4)
943	58	5.8	(11.6)	6.6	(13.3)
927	57	5.7	(11.4)	6.6	(13.1)
910	56	5.6	(11.2)	6.5	(13.0)
894	55	5.5	(11.0)	6.4	(12.8)
878	54	5.4	(10.8)	6.3	(12.6)
862	53	5.3	(10.6)	6.2	(12.5)
845	52	5.2	(10.4)	6.2	(12.3)
829	51	5.1	(10.2)	6.1	(12.2)

TABLE 30 - KLPS-D SIZE 5 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
813	50	5	(10.0)	6.0	(12.0)
797	49	4.9	(9.8)	5.9	(11.8)
780	48	4.8	(9.6)	5.8	(11.7)
764	47	4.7	(9.4)	5.8	(11.5)
748	46	4.6	(9.2)	5.7	(11.4)
732	45	4.5	(9.0)	5.6	(11.2)
715	44	4.4	(8.8)	5.5	(11.0)
699	43	4.3	(8.6)	5.4	(10.9)
683	42	4.2	(8.4)	5.4	(10.7)
667	41	4.1	(8.2)	5.3	(10.6)
650	40	4	(8.0)	5.2	(10.4)
634	39	3.9	(7.8)	5.1	(10.2)
618	38	3.8	(7.6)	5.0	(10.1)
602	37	3.7	(7.4)	5.0	(9.9)
585	36	3.6	(7.2)	4.9	(9.8)
569	35	3.5	(7.0)	4.8	(9.6)
553	34	3.4	(6.8)	4.7	(9.4)
537	33	3.3	(6.6)	4.6	(9.3)
520	32	3.2	(6.4)	4.6	(9.1)
504	31	3.1	(6.2)	4.5	(9.0)
488	30	3	(6.0)	4.4	(8.8)
472	29	2.9	(5.8)	4.2	(8.6)
455	28	2.8	(5.6)	4.2	(8.5)
439	27	2.7	(5.4)	4.1	(8.3)
423	26	2.6	(5.2)	4.0	(8.2)
407	25	2.5	(5.0)	3.9	(8.0)
390	24	2.4	(4.8)	3.8	(7.8)
374	23	2.3	(4.6)	3.8	(7.7)
358	22	2.2	(4.4)	3.6	(7.5)
342	21	2.1	(4.2)	3.7	(7.4)
325	20	2	(4.0)	3.6	(7.2)
309	19	1.9	(3.8)	3.5	(7.0)
293	18	1.8	(3.6)	3.4	(6.9)
277	17	1.7	(3.4)	3.4	(6.7)
260	16	1.6	(3.2)	3.3	(6.6)
244	15	1.5	(3.0)	3.2	(6.4)
228	14	1.4	(2.8)	3.1	(6.2)
212	13	1.3	(2.6)	3.0	(6.1)
195	12	1.2	(2.4)	3.0	(5.9)
179	11	1.1	(2.2)	2.9	(5.8)
163	10	1	(2.0)	2.8	(5.6)
147	9	0.9	(1.8)	2.7	(5.4)
130	8	0.8	(1.6)	2.6	(5.3)
114	7	0.7	(1.4)	2.6	(5.1)
98	6	0.6	(1.2)	2.5	(5.0)
82	5	0.5	(1.0)	2.4	(4.8)
65	4	0.4	(0.8)	2.3	(4.6)
49	3	0.3	(0.6)	2.2	(4.5)
33	2	0.2	(0.4)	2.2	(4.3)
17	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 31 - KLPP SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
820	100	10	(20.0)	10	(20.0)
812	99	9.9	(19.8)	9.9	(19.8)
804	98	9.8	(19.6)	9.8	(19.7)
796	97	9.7	(19.4)	9.8	(19.5)
788	96	9.6	(19.2)	9.7	(19.4)
779	95	9.5	(19.0)	9.6	(19.2)
771	94	9.4	(18.8)	9.5	(19.0)
763	93	9.3	(18.6)	9.4	(18.9)
755	92	9.2	(18.4)	9.4	(18.7)
747	91	9.1	(18.2)	9.3	(18.6)
738	90	9.0	(18.0)	9.2	(18.4)
730	89	8.9	(17.8)	9.1	(18.2)
722	88	8.8	(17.6)	9.0	(18.1)
714	87	8.7	(17.4)	9.0	(17.9)
706	86	8.6	(17.2)	8.9	(17.8)
697	85	8.5	(17.0)	8.8	(17.6)
689	84	8.4	(16.8)	8.7	(17.4)
681	83	8.3	(16.6)	8.6	(17.3)
673	82	8.2	(16.4)	8.6	(17.1)
665	81	8.1	(16.2)	8.5	(17.0)
656	80	8.0	(16.0)	8.4	(16.8)
648	79	7.9	(15.8)	8.3	(16.6)
640	78	7.8	(15.6)	8.2	(16.5)
632	77	7.7	(15.4)	8.2	(16.3)
624	76	7.6	(15.2)	8.1	(16.2)
615	75	7.5	(15.0)	8.0	(16.0)
607	74	7.4	(14.8)	7.9	(15.8)
599	73	7.3	(14.6)	7.8	(15.7)
591	72	7.2	(14.2)	7.8	(15.5)
583	71	7.1	(14.0)	7.7	(15.4)
574	70	7.0	(13.8)	7.6	(15.2)
566	69	6.9	(13.6)	7.5	(15.0)
558	68	6.8	(13.6)	7.4	(14.9)
550	67	6.7	(13.4)	7.4	(14.7)
542	66	6.6	(13.2)	7.3	(14.6)
533	65	6.5	(13.0)	7.2	(14.4)
525	64	6.4	(12.8)	7.1	(14.2)
517	63	6.3	(12.6)	7.0	(14.1)
509	62	6.2	(12.4)	7.0	(13.9)
501	61	6.1	(12.2)	6.9	(13.8)
492	60	6.0	(12.0)	6.8	(13.6)
484	59	5.9	(11.8)	6.7	(13.4)
476	58	5.8	(11.6)	6.6	(13.3)
468	57	5.7	(11.4)	6.6	(13.1)
460	56	5.6	(11.2)	6.5	(13.0)
451	55	5.5	(11.0)	6.4	(12.8)
443	54	5.4	(10.8)	6.3	(12.6)
435	53	5.3	(10.6)	6.2	(12.5)
427	52	5.2	(10.4)	6.2	(12.3)
419	51	5.1	(10.2)	6.1	(12.2)

TABLE 31 - KLPP SIZE 2 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
410	50	5	(10.0)	6.0	(12.0)
402	49	4.9	(9.8)	5.9	(11.8)
394	48	4.8	(9.6)	5.8	(11.7)
386	47	4.7	(9.4)	5.8	(11.5)
378	46	4.6	(9.2)	5.7	(11.4)
369	45	4.5	(9.0)	5.6	(11.2)
361	44	4.4	(8.8)	5.5	(11.0)
353	43	4.3	(8.6)	5.4	(10.9)
345	42	4.2	(8.4)	5.4	(10.7)
337	41	4.1	(8.2)	5.3	(10.6)
328	40	4	(8.0)	5.2	(10.4)
320	39	3.9	(7.8)	5.1	(10.2)
312	38	3.8	(7.6)	5.0	(10.1)
304	37	3.7	(7.4)	5.0	(9.9)
296	36	3.6	(7.2)	4.9	(9.8)
287	35	3.5	(7.0)	4.8	(9.6)
279	34	3.4	(6.8)	4.7	(9.4)
271	33	3.3	(6.6)	4.6	(9.3)
263	32	3.2	(6.4)	4.6	(9.1)
255	31	3.1	(6.2)	4.5	(9.0)
246	30	3	(6.0)	4.4	(8.8)
238	29	2.9	(5.8)	4.2	(8.6)
230	28	2.8	(5.6)	4.2	(8.5)
222	27	2.7	(5.4)	4.1	(8.3)
2147	26	2.6	(5.2)	4.0	(8.2)
205	25	2.5	(5.0)	3.9	(8.0)
197	24	2.4	(4.8)	3.8	(7.8)
189	23	2.3	(4.6)	3.8	(7.7)
181	22	2.2	(4.4)	3.6	(7.5)
173	21	2.1	(4.2)	3.7	(7.4)
164	20	2	(4.0)	3.6	(7.2)
156	19	1.9	(3.8)	3.5	(7.0)
148	18	1.8	(3.6)	3.4	(6.9)
140	17	1.7	(3.4)	3.4	(6.7)
132	16	1.6	(3.2)	3.3	(6.6)
123	15	1.5	(3.0)	3.2	(6.4)
115	14	1.4	(2.8)	3.1	(6.2)
107	13	1.3	(2.6)	3.0	(6.1)
99	12	1.2	(2.4)	3.0	(5.9)
91	11	1.1	(2.2)	2.9	(5.8)
82	10	1	(2.0)	2.8	(5.6)
74	9	0.9	(1.8)	2.7	(5.4)
66	8	0.8	(1.6)	2.6	(5.3)
58	7	0.7	(1.4)	2.6	(5.1)
50	6	0.6	(1.2)	2.5	(5.0)
41	5	0.5	(1.0)	2.4	(4.8)
33	4	0.4	(0.8)	2.3	(4.6)
25	3	0.3	(0.6)	2.2	(4.5)
17	2	0.2	(0.4)	2.2	(4.3)
9	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

TABLE 32 - KLPP SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
885	100	10	(20.0)	10	(20.0)
877	99	9.9	(19.8)	9.9	(19.8)
868	98	9.8	(19.6)	9.8	(19.7)
859	97	9.7	(19.4)	9.8	(19.5)
850	96	9.6	(19.2)	9.7	(19.4)
841	95	9.5	(19.0)	9.6	(19.2)
832	94	9.4	(18.8)	9.5	(19.0)
824	93	9.3	(18.6)	9.4	(18.9)
815	92	9.2	(18.4)	9.4	(18.7)
806	91	9.1	(18.2)	9.3	(18.6)
797	90	9.0	(18.0)	9.2	(18.4)
788	89	8.9	(17.8)	9.1	(18.2)
779	88	8.8	(17.6)	9.0	(18.1)
770	87	8.7	(17.4)	9.0	(17.9)
762	86	8.6	(17.2)	8.9	(17.8)
753	85	8.5	(17.0)	8.8	(17.6)
744	84	8.4	(16.8)	8.7	(17.4)
735	83	8.3	(16.6)	8.6	(17.3)
726	82	8.2	(16.4)	8.6	(17.1)
717	81	8.1	(16.2)	8.5	(17.0)
708	80	8.0	(16.0)	8.4	(16.8)
700	79	7.9	(15.8)	8.3	(16.6)
691	78	7.8	(15.6)	8.2	(16.5)
682	77	7.7	(15.4)	8.2	(16.3)
673	76	7.6	(15.2)	8.1	(16.2)
664	75	7.5	(15.0)	8.0	(16.0)
655	74	7.4	(14.8)	7.9	(15.8)
647	73	7.3	(14.6)	7.8	(15.7)
638	72	7.2	(14.2)	7.8	(15.5)
629	71	7.1	(14.0)	7.7	(15.4)
620	70	7.0	(13.8)	7.6	(15.2)
611	69	6.9	(13.6)	7.5	(15.0)
602	68	6.8	(13.6)	7.4	(14.9)
593	67	6.7	(13.4)	7.4	(14.7)
585	66	6.6	(13.2)	7.3	(14.6)
576	65	6.5	(13.0)	7.2	(14.4)
567	64	6.4	(12.8)	7.1	(14.2)
558	63	6.3	(12.6)	7.0	(14.1)
549	62	6.2	(12.4)	7.0	(13.9)
540	61	6.1	(12.2)	6.9	(13.8)
531	60	6.0	(12.0)	6.8	(13.6)
523	59	5.9	(11.8)	6.7	(13.4)
514	58	5.8	(11.6)	6.6	(13.3)
505	57	5.7	(11.4)	6.6	(13.1)
496	56	5.6	(11.2)	6.5	(13.0)
487	55	5.5	(11.0)	6.4	(12.8)
478	54	5.4	(10.8)	6.3	(12.6)
470	53	5.3	(10.6)	6.2	(12.5)
461	52	5.2	(10.4)	6.2	(12.3)
452	51	5.1	(10.2)	6.1	(12.2)

TABLE 32 - KLPP SIZE 4 - ECM CALIBRATION					
Set Point CFM	MANUAL % Display (option 6)	REMOTE 0-10Vdc (0-20mA) DC Signal (option 7)		REMOTE 2-10Vdc (4-20mA) DC Signal (option 8)	
443	50	5	(10.0)	6.0	(12.0)
434	49	4.9	(9.8)	5.9	(11.8)
425	48	4.8	(9.6)	5.8	(11.7)
416	47	4.7	(9.4)	5.8	(11.5)
408	46	4.6	(9.2)	5.7	(11.4)
399	45	4.5	(9.0)	5.6	(11.2)
390	44	4.4	(8.8)	5.5	(11.0)
381	43	4.3	(8.6)	5.4	(10.9)
372	42	4.2	(8.4)	5.4	(10.7)
363	41	4.1	(8.2)	5.3	(10.6)
354	40	4	(8.0)	5.2	(10.4)
346	39	3.9	(7.8)	5.1	(10.2)
337	38	3.8	(7.6)	5.0	(10.1)
328	37	3.7	(7.4)	5.0	(9.9)
319	36	3.6	(7.2)	4.9	(9.8)
310	35	3.5	(7.0)	4.8	(9.6)
301	34	3.4	(6.8)	4.7	(9.4)
293	33	3.3	(6.6)	4.6	(9.3)
284	32	3.2	(6.4)	4.6	(9.1)
275	31	3.1	(6.2)	4.5	(9.0)
266	30	3	(6.0)	4.4	(8.8)
257	29	2.9	(5.8)	4.2	(8.6)
248	28	2.8	(5.6)	4.2	(8.5)
239	27	2.7	(5.4)	4.1	(8.3)
231	26	2.6	(5.2)	4.0	(8.2)
222	25	2.5	(5.0)	3.9	(8.0)
213	24	2.4	(4.8)	3.8	(7.8)
204	23	2.3	(4.6)	3.8	(7.7)
195	22	2.2	(4.4)	3.6	(7.5)
186	21	2.1	(4.2)	3.7	(7.4)
177	20	2	(4.0)	3.6	(7.2)
169	19	1.9	(3.8)	3.5	(7.0)
160	18	1.8	(3.6)	3.4	(6.9)
151	17	1.7	(3.4)	3.4	(6.7)
142	16	1.6	(3.2)	3.3	(6.6)
133	15	1.5	(3.0)	3.2	(6.4)
124	14	1.4	(2.8)	3.1	(6.2)
116	13	1.3	(2.6)	3.0	(6.1)
107	12	1.2	(2.4)	3.0	(5.9)
98	11	1.1	(2.2)	2.9	(5.8)
89	10	1	(2.0)	2.8	(5.6)
80	9	0.9	(1.8)	2.7	(5.4)
71	8	0.8	(1.6)	2.6	(5.3)
62	7	0.7	(1.4)	2.6	(5.1)
54	6	0.6	(1.2)	2.5	(5.0)
45	5	0.5	(1.0)	2.4	(4.8)
36	4	0.4	(0.8)	2.3	(4.6)
27	3	0.3	(0.6)	2.2	(4.5)
18	2	0.2	(0.4)	2.2	(4.3)
9	1	0.1	(0.2)	2.1	(4.2)

NOTE: CFM values below recommended minimum may affect life of motor.

PNEUMATIC CONTROLS

GENERAL

SINGLE FUNCTION PNEUMATIC CONTROLLER CONTROL SEQUENCES (1300-1305, 1400-1401)

To properly balance the system, all ductwork and outlets must be installed and connected tightly. Reference piping/wiring diagram on unit for specifics for the control sequence selected for the unit.

UNITS WITH SINGLE-FUNCTION CONTROLLERS

1. Determine sequence of operations; Reverse-Acting, Normally Closed [RANC], Direct-Acting, Normally Open [DANO]. This can be accomplished by reading the diagram affixed to the unit. The standard RANC controller is gray colored; the DANO controller is beige. See Figures 10-12.
2. Check that main air pressure at the controller. Main air should equal 18 to 25 psi. Main air must be clean and dry.
3. Check for primary airflow in the inlet duct, using a differential pressure sensor tapped into the differential pressure sensor line tees.
4. Verify that the installed room thermostat is compatible with the unit control.
5. Close the primary air damper.
   a. RANC— disconnecting the actuator from the controller should allow the damper to close completely.
   b. DANO — connecting to 20-psi air supply directly to the actuator should close the damper completely.
6. Start the blower motor by doing one of the following:

   KLPS, KFSS, KQFS & QFC Units:

   Both RANC and DANO — Connect electrical power to the blower motor control.

   KLPP, KQFP & QFV Units:

   RANC— Connect the main compressed air line to the blower control, bypassing the thermostat input.

   DANO — Disconnect the thermostat line from the blower controls. These steps should energize the fan.
7. Balance the supply outlets using a proportional air volume method.
   a. With the blower discharging full volume (SCR on max setting), measure the total air volume.
   b. Calculate the percentage of the design air volume needed by each outlet.
   c. Multiply the total air volume by the percent-of-design air volume for each diffuser.
   d. Balance each outlet according to the requirements calculated above.
8. Balance the unit fan discharge:
   a. Measure the total flow discharging from the unit.
   b. Adjust the discharge flow from the unit using the unit electronic speed control (SCR).
9. Reconnect the damper actuator and/or the thermostat tubing to the velocity controller with the fan still running. Make sure the piping is as shown on the unit piping/wiring diagram.
10. Balance the primary (cooling) air volume:

    NOTE: To balance the primary air side of the KLPP, KQFP & QFV unit only, the blower motor must be disconnected.
    a. Connect the Magnehelic or inclined manometer (0 to 2.0 in. wg scale, maximum) to the differential pressure sensor tubing.
    b. Measure the volume of air flowing through the inlet using the calibration curve affixed to the unit.

    RANC

    1. With a 0 psi thermostat signal, measure the unit maximum airflow.
    2. Rotate the “HI” adjustment knob on the velocity controller, adjust airflow to the desired maximum setting.

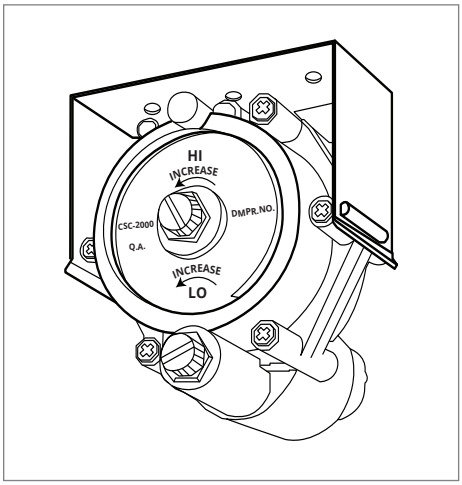


FIGURE 10 – Pneumatic Single Function Volume Controller (Normally Open) for Pneumatic Control Unit (Beige Color)

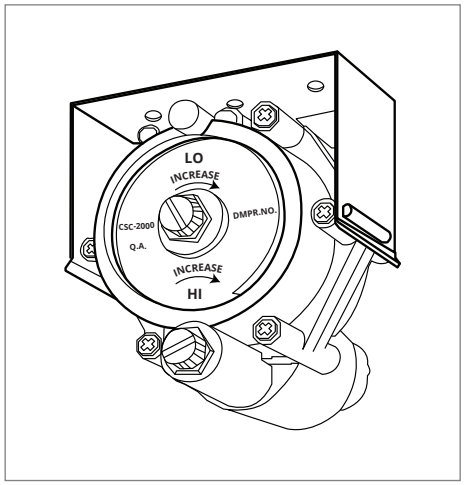


FIGURE 11 – Pneumatic Single Function Volume Controller (Normally Closed) for Pneumatic Control Unit (Grey Color)

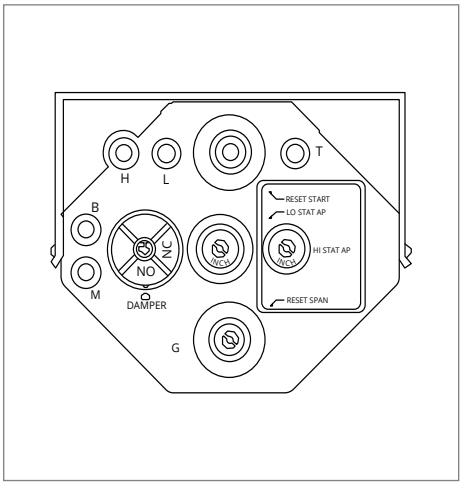


FIGURE 12 – Multi-Function Reset Volume Controller

3. With the 15 psig (or greater) thermostat signal, measure the unit minimum airflow.

DANO

1. At a 0 psi stat signal, measure the unit minimum airflow.
2. Rotate the "LO" adjustment knob of the velocity controller, adjust the minimum flow to the desired setting, as read from the differential pressure sensor. With a 15 psig (or greater) thermostat signal, measure the unit maximum airflow.
3. Rotate the "HI" adjustment knob on the velocity controller; adjust airflow to the desired maximum setting.

11. Reconnect the power to the blower motor on the KLPP, KQFP & QFV unit.

NOTES:

1. **The single function control system uses a KMC CSC 2000 series velocity controller with a rated air consumption of 0.0083 SCFM at 20 psi main air pressure.**
2. **The maximum and minimum limits are both changed when adjusting the CENTER knob. For this reason, the center knob should always be set first.**
3. **Refer to the Table 19 — Troubleshooting if any of the above steps do not result in satisfactory performance.**

UNITS WITH MULTI-FUNCTION CONTROLLERS (SEQUENCES 1306-1317 AND 1402-1405)

1. Determine sequence of operation; Direct-Acting, Normally Closed [DANC], Reverse-Acting, Normally Closed [RANC], Direct-Acting, Normally Open, or Reverse-Acting, Normally Open. This can be accomplished by reading the diagram affixed to the unit. All sequences above utilize a four-function controller, allowing for changeover from a given sequence to another.
2. Check the main air pressure at the controller. Main air should equal 18 to 25 psi. Main air must be clean and dry.
3. Check for primary airflow in the inlet duct, using a differential pressure sensor tapped into the differential pressure sensor signal line tees.
4. Verify that the installed room thermostat is compatible with the unit control.
5. Close the primary air damper.
   a. DANC, RANC — Disconnecting the actuator from the controller should allow the damper to close completely.
   b. DANO, RANO — Connecting a 20 psi air supply directly to the actuator should close the damper completely.
6. Start the blower motor by doing one of the following:

   KLPS, KFSS, KQFS, & QFC Units:

   DANC, RANC, DANO, RANO — Connect electrical power to the blower motor controls.

   KLPP, KQFP & QFC Units:

   DANC, DANO — Disconnect the thermostat line from the blower control.

   RANC, RANO — Connect the main compressed air line to the blower control, bypassing the thermostat input. These steps should energize the fan.
7. Balance the supply outlets using a proportional air volume method:
   a. With the blower discharging full volume (SCR on max setting), measure the total air volume.
   b. Calculate the percentage of the design air volume needed by each outlet.
   c. Multiply the total air volume by the percent-of-design air volume for each diffuser.
   d. Balance each outlet according to the requirements calculated above.
8. Balance the unit fan discharge:
   a. Measure the total flow discharging from the unit.
   b. Adjust the discharge flow from the unit using the unit electronic speed control (SCR).
9. Reconnect the damper actuator to the velocity controller with the fan still running. Make sure the piping is as shown on the unit piping/wiring diagram.
10. Balance the primary (cooling) air volumes:

    NOTE: To balance the primary air side of the KLPP, QFV & KQFP units only, the blower motor must be disconnected.
    a. Connect a Magnehelic or inclined manometer (0 to 2.0 in. wg scale, maximum) to the differential pressure sensor tubing.
    b. Measure the volume of air flowing through the inlet using the calibration curve affixed to the unit.
    c. Adjust the "LO STAT" knob, with a 0 psi thermostat signal, to obtain the desired airflow setting.

Depending on the control sequence desired, the "LO STAT" knob will vary either the minimum setting or the maximum setting as follows:

DANC — "LO STAT" knob adjusts the minimum setting.

RANC — "LO STAT" knob adjusts the maximum setting.

DANO — "LO STAT" knob adjusts the minimum setting.

RANO — "LO STAT" knob adjusts the maximum setting.

OPERATION SEQUENCES

1. During maximum thermostat cooling demand, the primary air damper will open in the maximum airflow setting providing cold primary air at the preset maximum volume. Accessory coils, if supplied, are off, and the unit should discharge primary air only.
2. When the thermostat modulates between maximum cooling and satisfied set point, the primary air damper responds by proportional settings. Accessory coils, if

supplied, are off. The KLPS, KFSS, KQFS and QFC units only will be inducing plenum air and mixing it with the cold primary air. The KLPP, QFV and KQFP fan will not induce any plenum air at this point.

3. When the thermostat is modulating between maximum heating demand and satisfied setpoint, the primary air damper will be at the minimum air volume setting. A maximum amount of plenum air is induced at this point. In sequence, the first and second stages of electric reheat will energize, if supplied. If hot water heating coils are supplied, they will either open fully or modulate open.
4. During thermostat demand for maximum heating, primary air will flow through the unit at the preset minimum setting, maximum amount of plenum air will be induced, and heating coils, if supplied, are full on. See Table 33 for Pneumatic Control Troubleshooting.
5. Adjust the "HI STAT" knob, with a 15 psi thermostat signal, to obtain the desired airflow setting. Depending on the control sequence desired, the "HI STAT" knob will vary either the minimum setting or the maximum setting as follows:

   DANC — "HI STAT" knob adjusts the maximum setting

   RANC — "HI STAT" knob adjusts the minimum setting

   DANO — "HI STAT" knob adjusts the maximum setting

   RANO — "HI STAT" knob adjusts the minimum setting
6. To adjust the thermostat reset start point, remove gage port ("G") cap and attach a 0 to 30 psi pressure gage and note the pressure reading. Adjust the thermostat pressure to the controller, "T" port to the desired start point. Adjust the "RESET START" knob until the gage pressure begins to change slightly. Remove pressure gage and replace cap.
7. To adjust the thermostat reset span from standard 5 psi, remove gage port ("G") cap and attach a 0 to 30 psi pressure gage and note the pressure reading. Adjust the thermostat pressure to the controller "T" port to the desired start point. Adjust the "RESET SPAN" knob until the gage pressure equals the desired reset span. Remove gage and replace cap.
8. To change logic from a given sequence to another, follow the steps below:
   a. To change from N.O. to N.C. or from N.C. to N.O., loosen the "damper" dial screw and rotate the dial until the desired damper position indicator is aligned with the arrow. The VAV damper must be physically changed to desired position.
   b. To change from DA to RA or from RA to DA, no configuration changes are required — use the appropriate calibration procedures from above.
9. Reconnect the power to the blower motor on the KLPP, QFV & KQFP units.

NOTES:

1. The multi-function control system uses a Krueter CSC 3000 series velocity controller with a rated air consumption of 1.00 SCFH at 20-psi main air pressure.
2. The maximum and minimum limits are both changed when adjusting the center knob. The center knob should always be set first.

TABLE 33 – TROUBLESHOOTING PNEUMATIC CONTROLS

PROBLEM	LIKELY CAUSE
Controller does not reset to maximum minimum set point during balancing procedure	Thermostat signal is being used for control signal. An artificial signal must be used.
Controller does not reset to maximum or point during operation	Thermostat is not demanding minimum set maximum or minimum air volume. Main air pressure at the controller is less than 15 psi.
Pneumatic actuator does not stroke fully	Leak in pneumatic tubing between the controller and the actuator. Main air pressure at the controller is less than 15 psi. Leak in the actuator diaphragm.
Air valve stays in wide open position	Differential pressure sensor is blocked or obstructed. Insufficient supply air pressure in the unit inlet.

ANALOG CONTROLS

INSTALLATION AND BALANCING PROCEDURES

The Analog Electronic Control System is a pressure independent volume reset control that uses a KMC CSP-4702 controller-actuator (see Fig. 13).

Adjustments for the minimum and maximum airflow settings are made at the thermostat. The thermostat (CTE-5202) operates on a 16 VDC power supply from the CSP 4702 controller and outputs a 0 to 10 VDC signal on the AO1 and AO2 terminals. AO1 is used as the cooling output and AO2 is used as the heating output.

THERMOSTAT INSTALLATION

For proper operation, mount the thermostat on an interior wall. Do not mount the thermostat in a location that will cause it to be affected by direct sunlight or other heat or cold sources. The thermostat should be clear of all obstructions so it can properly sense the room temperature. Complete rough-in wiring at each location prior to thermostat installation. Cable insulation must meet local building codes.

1. Remove thermostat cover. If the thermostat is locked on the back plate, turn the two hex screws in on the bottom of the cover (in the two outermost holes) in the back plate CLOCKWISE until they clear the cover. Do not remove these screws completely. Swing the thermostat up and away from the back plate to remove it.
2. Route the wires through the opening in the back plate.
3. Install the back plate directly to the junction box using the screws supplied with the thermostat. Verify the hex screws used for securing the cover are located at the bottom before installing.
4. Connect the wires to the terminal block. Refer to the wiring diagram located on the inside cover of the control enclosure of each unit showing the wiring terminations. The wiring schematic can also be found on the control sequence submittal found on the Krueger website.
5. Replace the thermostat cover. Turn the two hex screws COUNTER CLOCKWISE until they are flush with the bottom cover and secure it to the back plate.

PROGRAMMING THERMOSTAT

1. The thermostat has three sequences that are selectable from the display screen. To access the configuration menu on the thermostat, press and hold the Up and Down arrows for 10 seconds until the display starts flashing “LIMITS”. Use the Up and Down arrows to scroll between the different menu options or set a specific value. Use the Setpoint button to select a menu or set a value.
2. To set the minimum and maximum airflow limits, Use AO1 Min and AO1 Max or AO2 Min and AO2 Max. Use the Table 34 below to determine thermostat setting for the CFM per inlet size.
3. For details on how to program the thermostat for each control sequence see the specific control sequence submittal. The control sequence submittals can be at the Krueger Website: www.krueger-hvac.com.

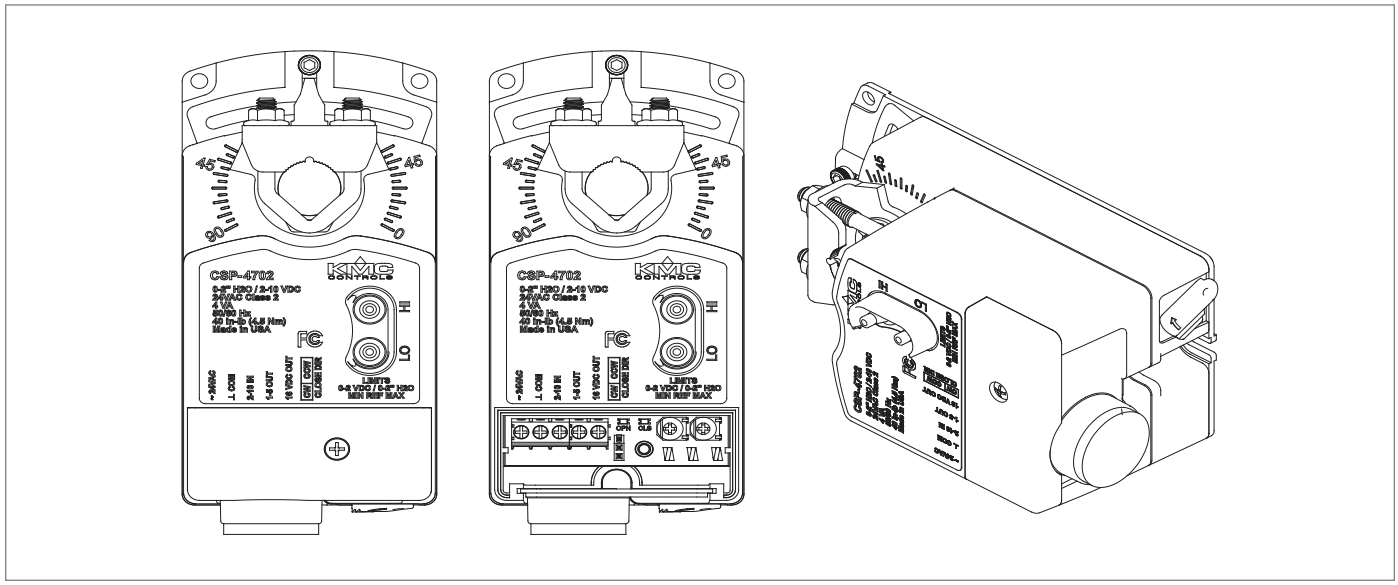


Figure 13: CSP-4702 Controller/Actuator

NOTE: Adjustments for the minimum and maximum airflow settings are made at the thermostat. The thermostat (CTE-5202) operates on a 16 Vdc power supply from the CSP 4702 controller and outputs a 0 to 10 Vdc signal on the AO1 and AO2 terminals. AO1 is used as the cooling output and AO2 is used as the heating output." before Thermostat installation.

TABLE 34: CFM CHART FOR SETTING MIN AND MAX VALUES ON THERMOSTAT													
AO1 & AO2	SENSOR SIGNL	CFM PER INLET SIZE											
		4	5	6	7	8	9	10	12	14	16	20	22
0-2	0.00	0	0	0	0	0	0	0	0	0	0	0	0
2.1	0.03	36	57	81	111	145	183	226	326	444	580	315	1107
2.2	0.05	51	80	115	157	205	259	320	461	627	820	445	1565
2.3	0.08	63	98	141	192	251	318	392	565	768	1004	545	1917
2.4	0.10	72	113	163	222	290	367	453	652	887	1159	630	2214
2.5	0.13	81	127	182	248	324	410	506	729	992	1296	704	2475
2.6	0.15	89	139	200	272	355	449	555	798	1087	1420	771	2711
2.7	0.18	96	150	216	293	383	485	599	862	1174	1533	833	2928
2.8	0.20	102	160	231	314	410	519	640	922	1255	1639	891	3130
2.9	0.23	109	170	244	333	435	550	679	978	1331	1739	945	3320
3.0	0.25	115	179	258	351	458	580	716	1031	1403	1833	996	3500
3.1	0.28	120	188	270	368	481	608	751	1081	1472	1922	1045	3671
3.2	0.30	125	196	282	384	502	635	784	1129	1537	2008	1091	3834
3.3	0.33	131	204	294	400	522	661	816	1175	1600	2089	1136	3991
3.4	0.35	136	212	305	415	542	686	847	1220	1660	2168	1178	4141
3.5	0.38	140	219	316	430	561	710	877	1263	1718	2244	1220	4287
3.6	0.40	145	226	326	444	580	733	905	1304	1775	2318	1260	4427
3.7	0.43	149	233	336	457	597	756	933	1344	1829	2389	1299	4563
3.8	0.45	154	240	346	471	615	778	960	1383	1882	2459	1336	4696
3.9	0.48	158	247	355	484	632	799	987	1421	1934	2526	1373	4824
4.0	0.50	162	253	364	496	648	820	1012	1458	1984	2592	1408	4950
4.1	0.53	166	259	373	508	664	840	1037	1494	2033	2656	1443	5072
4.2	0.55	170	265	382	520	680	860	1062	1529	2081	2718	1477	5191
4.3	0.58	174	271	391	532	695	879	1086	1563	2128	2779	1510	5308
4.4	0.60	177	277	399	543	710	898	1109	1597	2174	2839	1543	5422
4.5	0.63	181	283	407	555	724	917	1132	1630	2218	2898	1575	5534
4.6	0.65	185	289	416	566	739	935	1154	1662	2262	2955	1606	5644
4.7	0.68	188	294	423	576	753	953	1176	1694	2305	3011	1636	5751
4.8	0.70	192	299	431	587	767	970	1198	1725	2348	3067	1666	5857
4.9	0.73	195	305	439	597	780	987	1219	1755	2389	3121	1696	5960
5.0	0.75	198	310	446	608	794	1004	1240	1785	2430	3174	1725	6062
5.1	0.78	202	315	454	618	807	1021	1260	1815	2470	3227	1753	6162
5.2	0.80	205	320	461	627	820	1037	1281	1844	2510	3278	1782	6261
5.3	0.83	208	325	468	637	832	1053	1300	1873	2549	3329	1809	6358
5.4	0.85	211	330	475	647	845	1069	1320	1901	2587	3379	1836	6454
5.5	0.88	214	335	482	656	857	1085	1339	1929	2625	3428	1863	6548
5.6	0.90	217	340	489	666	869	1100	1358	1956	2662	3477	1890	6641
5.7	0.93	220	344	496	675	881	1115	1377	1983	2699	3525	1916	6732
5.8	0.95	223	349	502	684	893	1130	1395	2009	2735	3572	1941	6823
5.9	0.98	226	353	509	693	905	1145	1414	2036	2771	3619	1967	6912
6.0	1.00	229	358	515	702	916	1160	1432	2062	2806	3665	1992	7000

ANALOG CONTROL TROUBLESHOOTING

The following troubleshooting guide is directed towards single duct cooling applications, the same concepts can be applied to other configurations.

NOTE: For about 15 seconds after power is applied, no rotation occurs and one or both of the LEDs will flash.

CONTROLLER

1. Check that the shaft moves freely. (Press and hold the actuator release clutch and manually rotate the shaft.)
2. Check wiring. (See Wiring Issues section below.)
3. Check for a tripped circuit breaker to the transformer, for proper supply voltage from the transformer (or power supply), and for enough capacity (VA) for all connected devices.
4. Check that the direction jumper is in the proper position.
5. Check the polarity and level of the input signal from the thermostat.

WRONG ROTATION DIRECTION OR STROKE RANGE

1. Check the position of the direction jumper.
2. Check the Min and Max flow limits on the thermostat
3. Check the adjustable stop position.

NO PRESSURE OUTPUT SIGNAL FROM INLET SENSOR

1. Check the wiring.
2. Check air flow and sensor. Tubing should be free of kinks and restrictions. Sensor must be oriented in the correct airflow direction.

WIRING ISSUES

1. Check for correct wiring at unit and thermostat.
2. At the Controller, verify 24 VAC at terminals "~" (phase) and "-" (ground). Tolerance can be –15% to +20% (20.4 to 28.8 VAC).
3. Verify 16 VDC at terminals "16 VDC" and "COM"
   a. Tolerance is 15.0 to 17.0 VDC power supply to thermostat.
   b. If not correct, disconnect thermostat and recheck.
   c. If still incorrect, replace CSP controller.
4. Check "Requested Flow" voltage on terminal "2-10 IN" and "COM".
   e. Use Table 7 to correlate into cubic feet per minute (CFM)
   f. If reading is not what is desired, see "calibration to adjust thermostat.

   NOTE: Never jumper terminal 16 VDC to "-" as this would cause a short, and possibly damage the power supply

   NOTE: When using the same transformer for more than one control, the phase and ground must be consistent with each device.

WATER VALVE INSTALLATION

WARNING: Disconnect power before wiring or electrical shock and personal injury could result.

Water valves are field supplied. Most control manufacturers offer three different hot water valve applications; on/off and floating point, and proportional control. The controls contractor should provide water valve specs used on controls supplied by others. To connect the field-supplied water valves to the controller, refer to the wiring labels for the control package.

SERVICE

CONTROLS

No periodic preventive maintenance is necessary.

FAN MOTOR AND WHEEL

The fan motor and wheel are accessible from the bottom of the unit. Remove the bottom panel to check the wiring or remove the fan wheel or motor.

The PSC motors are equipped with long life sleeve bearings with non-detergent SAE (Society of AutomotiveEngineers)20 oil. Do not add oil to motors.

NOTE: The EC motor has permanently lubricated ball bearings that require NO maintenance.

TO CHECK WIRING (REFER TO FIG 14-16, NEXT PAGE)

The PSC motor is connected by quick-connect terminals to the capacitor (brown wire), the housing wire (green ground wire), and the control box (black wire and white wire). Verify that the fan motor wiring is correct as shown in these figures.

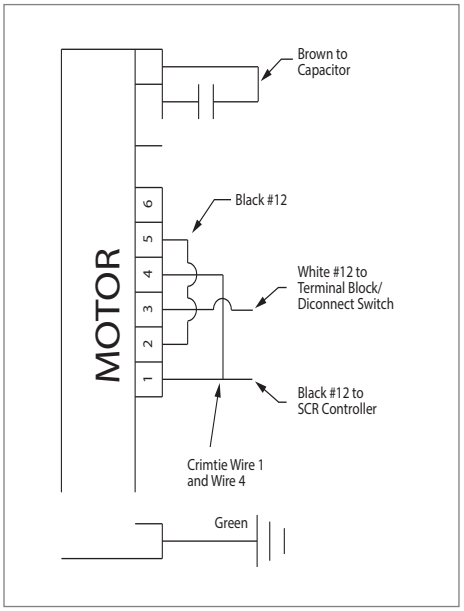


FIGURE 14 – PSC Motor Wiring Terminal Block – 115V, Single Phase

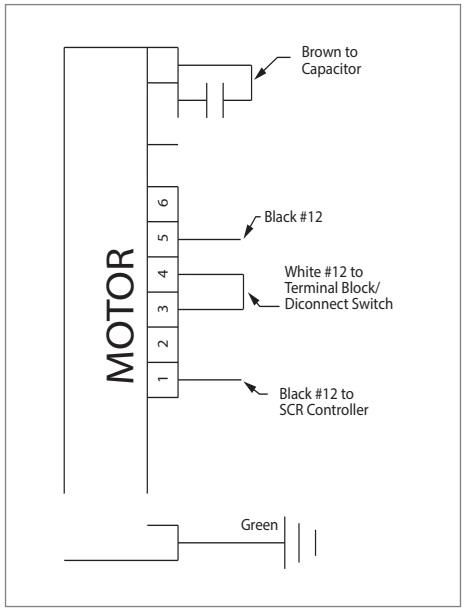


FIGURE 15 – PSC Motor Wiring Terminal Block – 208/240V, Single Phase

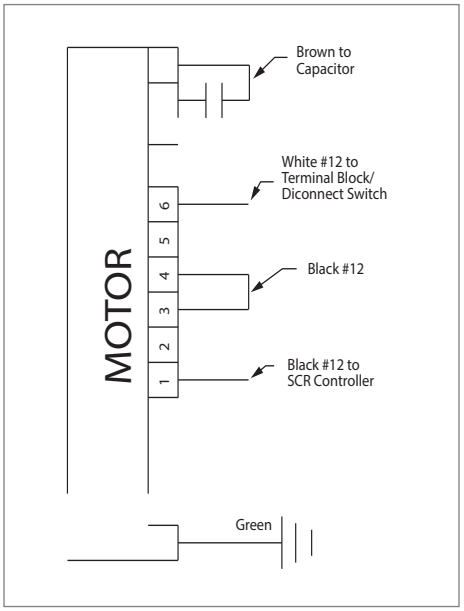


FIGURE 17 – PSC Motor Wiring Terminal Block – 277V, Single Phase

TROUBLESHOOTING

To remove the fan motor and wheel:

1. Disconnect motor wiring. Note connections.
2. The fan motor and wheel assembly is attached to the discharge panel with 4 hex nuts.
3. Remove the motor by removing the 3 screws that attach the torsion flex or belly band mounts to the inlet ring.
4. Remove wheel by unscrewing the hub set screws that are accessed through the open end of the wheel.

FAN MOTOR WIRING

Refer to the fan motor wiring details shown on the wiring diagram attached to the unit. Failure to reconnect the fan properly can cause damage to the motor and/or serious personal injury.

FAN MOTOR MAINTENANCE

Unit motors are equipped with permanently lubricated bearings. Inspect fan and motor assembly for accumulation of dust and dirt as required by operating environment. Clean as necessary.

IF FAN MOTOR DOES NOT RUN:

1. Make sure that there is free rotation of blower wheel.
2. Remove fan packing.
3. Verify that there is no freight or installation damage.
4. Check for proper unit power.
5. Disconnects should be on, and check optional fusing.
6. Check for proper control signal, pie switch setting, proper air control 24 vac at fan contactor, and that the coil is energized.

IF FAN MOTOR RUNS, EXCESSIVE NOISE:

1. Make sure the blower, and all components have no clearance problems and are securely attached.
2. Verify the integrity of ductwork, make sure there are no leaks or loose connections rattling diffusers or balancing dampers.
3. Confirm that the maximum CFM not too high, or discharge static pressure is too low. If fan motor runs, insufficient airflow:
4. Check for ductwork restrictions, dirty air filters, and clogged water coils.
5. Re-adjust fan speed control.
6. Discharge static pressure too high.

IF REPAIR OR REPLACEMENT IS REQUIRED:

1. Motor and fan should be removed as an assembly. Disconnect all power before servicing.
2. Remove the four hex nuts from the mounting lugs holding the fan assembly to the discharge panel, and lower the assembly. NOTE: Do not allow assembly to hang from wiring.
3. Loosen the setscrew if removing motor from blower.
4. Hold the blower wheel to the motor shaft. Remove the three screws holding motor to the fan housing, and slide motor and fan housing apart. Reverse the procedure for assembly.

NOTE: Over-tightening motor mounting screws may crush isolation bushings, and cause excessive fan noise and wear.

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